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Addis Ababa University
College of Natural Science
School of Information Science

Usability and Accessibility Model for E-Government Websites in Ethiopia

By

YOSEPH ZELEKE

*June 2018,
Addis Ababa, Ethiopia*





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**A Thesis Submitted to the School of Graduate Studies of Addis
Ababa University in Partial Fulfillment of the Requirements for
the Degree of Master of Science in Information Science**

By
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Advisor: Rahel Bekele (PhD)

*June 2018,
Addis Ababa, Ethiopia*

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*Yoseph Zeleke
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Addis Ababa, Ethiopia*

ABSTRACT

E-Governance is the public sector's use of information and communication technologies with the aim of improving information and service delivery, and making government more accountable, transparent and effective. Based on this, the development of E-Government websites and portals are main components of the e-Government strategy implementations for the last nine years in Ethiopia. However, services optimizations with usability and accessibility are key issues of Ethiopia e-Government services development.

Therefore, the ultimate goal of this study is creation of usable, accessible and sustainable Ethiopian e-Government websites with four stage of research analysis, through proposed model. The investigations results are used to provide a clear picture of what needs to be improves from management and user point of views and also from other stakeholders of e-Government services. This study applies mixed methods of data collection and analysis, that integrating quantitative and qualitative data, using questionnaires' and interviews to identify the key usability and accessibility issues of Ethiopia e-Government websites services. The data collection and analysis are primarily from management and users' point of views are analyzed and discussed and also interpretations of the data are presented using factor analysis and other analytical techniques. Afterward, expert based e-Government website evaluations are presented and discussed using heuristics evaluation principles'. Finally, automatics accessibility evaluation based on WCAG 2.1 guidelines using online WAVE Accessibility Tool assessment results are analyzed, presented and discussed.

The findings of the study confirm that, Ethiopia e-Government websites have many usability and accessibility gaps. In general, the current status of e-Government websites not fulfill most of usability features of Heuristics rules and did not conform to W3C, WCAG 2.1. Therefore, it is recommended that pay attention to users' requirements, improves websites design, functionality, language and services capability; get better websites content and documentations, increase the capacity and awareness levels of managements and employees, and implement planed e-Government websites development and assessment activities.

The proposed model was adapted based on the study outcomes and Ethiopian context. It has five components: Manager and Web Administrators; End-Users; Usability & Accessibility Evaluator Committee, Public Relation and Communication Affairs Bureau and Development Process.

Finally, the aim of the study was achieved by conducting mixed and different sides' studies, and adapted usability and accessibility model. Moreover, the findings reported by the researcher may alert organization managements, IT experts, web developers and other stakeholder to give more emphasis on specific usability and accessibility features which are often being neglected.

Keywords: e-Government websites, usability and accessibility evaluation, usability and accessibility gaps, disability, Heuristics, WAVE, proposed model

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LIST OF ACRONYMS

- AAU – Addis Ababa University
- EGDI - Electronics Government Development Index
- E-Government – Electronics Government
- E-Learning - Electronics Learning
- E-procurement - Electronics Procurement
- FAQs – Frequently Asked Questions
- FDRE - Federal Democratic Republic of Ethiopia
- FTA - Federal Transport Authority
- G2B - Government-to-Business
- G2C - Government-to- Citizens
- G2E – Government-to-Employees
- G2G - Government-to-Government
- GTP - Growth and Transformation Plan
- ICT - Information and Communication Technology
- ICTDA - Information and Communication Technology Development Agency
- ISO - International Organization for Standardization
- IT - Information Technology
- MCIT - Ministry of Communication and Information Technology
- MCIT - Ministry of Communication and Information Technology
- MoFA - Ministry of Foreign Affairs
- MOT - Ministry of Trade
- PSSA - Public Servants Social Security Agency
- SPSS - Statistical Package for the Social Sciences
- TAW - Web Accessibility Tester
- UAEC - Usability and accessibility evaluator committee
- UCD - User-centered design
- UEM - Usability evaluation methods
- UN - United Nations
- URL - Uniform Resource Locator
- W3C - World Wide Web Consortium
- WAI - Web Accessibility Initiative
- WCAG - Web Content Accessibility Guidelines
- WUM - Web Usability Model
- WWW- World Wide Web

CHAPTER ONE

INTRODUCTION

1.1 Background

The increasing use of information and communication technology (ICT) in particular the internet has become prominent and has the potential to change fundamentally how organizations work (La Porte et al., 2001). Internet provides an opportunity for governments to offer services to their citizens via websites.

As e-Government websites are the gateways for the public to access information and services provided by the government in the information age, the e-Government websites have to be easy for all citizens to use, including those with disabilities (Hoi-Yan & Panayiotis Zaphiris, 2003). In this regard, the Government of Ethiopia through its Ministry of Communication and Information Technology (MCIT) has developed a number of websites and e-services for various government ministries and agencies.

The National Growth and Transformation Plan (GTP) report indicates that for 34 government institutes web based 164 transactional electronics services have been developed (during the GTP I and GTP II plan period). Likewise, wider application of e-government, e-learning, e-library, mobile banking and others different web-based services have enabled to improve the quality and efficiency of public and private services (FDRE, GTPII, 2016).

An e-Government services with better usability features helps to improve civil service performance. Moreover, user satisfaction can increase and the users' engagement with e-Government services is promoted (Bwalya, 2009). In addition, this initiative can play the role of an advocator for more organizations to expand their online government services.

Since the initiation of the web, research in website usability and accessibility has been on the increase both in developed and developing countries. There have been studies which focused on "The Usability and Content Accessibility of the e-Government in the UK", (Hoi-Yan & Panayiotis Zaphiris, 2003), "Usability of Government Websites in Uganda" (Edgar & Nena, 2010), "E-Government accessibility in Australia and China" (Wan et al., 2002) and in other studies, a lot

of usability and accessibility issues in both developed and developing countries websites have been discovered.

Web usability generally means that websites are clear, simple, consistent and easy for users to use (Cappel & Huang, 2007). Evaluating the usability and accessibility of government website helps to learn effectiveness and efficiency of web usage and improve user satisfaction and government services. The primary focus of evaluating the usability is on the elements of learnability, memorability, effectiveness, efficiency and satisfaction for all portal/website developers and users (ISO-9241-210, 2010). Like usability, accessibility is usually refers to the use of websites or e-Systems by people with special needs, particularly those with disabilities and older people ISO 9241-171 (2008b). In general, World Wide Web Consortium (W3C) defined web accessibility as “accessibility means that people with disabilities can perceive, understand, navigate and interact with the web”.

1.2 Statement of the Problem

As the information revolution gradually permeates developing countries, more and more governments are embracing e-Government as a tool for enabling, enhancing and accelerating interaction with citizens, increasing effectiveness and efficiency in the delivery of government services, and improving transparency and accountability. The main drivers for e-Government (and reform) are limited trust and confidence in government, low levels of citizen and business satisfaction with public services, fragmentation and duplication of government services and information sources, knowledge economy (i.e., new and emerging technologies, demand for business intelligence and evidence to aid decision-making) and national competitiveness for further economic development (World Bank, 2009).

Government of Ethiopia through its Ministry of Communication and Information Technology (MCIT) is spending a lot of budget for the development of a number of e-Government, like Ethiopian Government Portal /www.ethiopia.gov.et/, Ethiopian e-Service Portal /www.eservices.gov.et/, Open Data Portal /www.data.gov.et/ and many other organizations' websites and electronics services development (FDRE, GTPII, 2016).

According to Hoi and Panayiotis (2003), the number of people with disabilities is expected to increase significantly in the next decade with world's population is rapidly growing older, and the number of internet users of old age also increases exponentially. This leads to the need that website designers have to provide the issues of content accessibility when designing websites.

According to Barnes and Vidgen (2004), Usability and accessibility affects the success or failure of e-Governments services. Bader (2011) also pointed out that “more user-friendly and usable government websites indicate that a country is heading towards the full implementation of e-Government services”. Improving the supply of e-Government services, increasing the demand of citizens for e-Government services as well as improved citizen satisfaction with them and with the overall public administration are considered as the main indicators of e-Government success.

E-Government still faces some big challenges when considering their interaction with users, largely due to the accelerated development e-Government has faced. Current poor usability often prevents e-Government adoption and development, it affects the success or failure of e-Government, and a low usability index is a major symptom of the failure of an e-Government project. In Ethiopia also, the e-Government services implementation challenge and cancellation problems are the major issues (Aserat, 2017).

Usability is one of the most important quality factors in any quality model for the website (Mebrate, 2010). Therefore, evaluation of usability, accessibility and quality of a website/portal helps to assess whether or not the website/portal is meeting its intended purpose for the intended users. Besides, the results of the evaluation can help to understand the parts of the website that need modifications to bring an improvement in the website.

According to Wu and Ouffutt (2002), states that most work on website applications has been done on making them more powerful but, relatively little has been done to ensure their quality. Those quality factors include reliability, availability, usability and security. Beirekdar (2002), point out that “an estimated 90% of websites provide inadequate usability”.

Some e-Government websites might have a number of excellent services, but if the website is not usable, only a small number of users will be able to take advantage of the available services. According to this, Pearrow (2000) pointed out that “a website that is not usable is useless”. By

implementing better usability, e-Government can provide a better civil service performance, promote engagement between the user and the services and can also improve user satisfaction levels (Bader, 2011).

An ISO/IEC 9126-1 standard mentions six principle categories of quality characteristics of usability. They are functionality, reliability, usability, efficiency, maintainability and portability. Usability represents one of the most important acceptance criteria for interactive software applications in general and web applications in particular (Hitz, Leitner, & Melcher, 2006). It is one of the most important quality factors for web applications. Unusable web applications cause users to reject them. A good usable web application is that one from which users can achieve their goals effectively, efficiently and satisfactorily (Abran, 2003).

Usable websites are those which help users to accomplish a goal easily, quickly, and pleasantly. Website usability is a core component of web quality. Without good usability features the website quality will always be a question mark. There is a sort of tug of war between website application content growth and need for more usable websites. In other words websites are becoming more complex and at the same time higher usability is also desired. In order to keep the balance between the two, appropriate usability inspection and testing methods needs to be employed during product development of websites (Umar & Khan, 2008).

MCIT also prepare guidelines for the development of government informational portals especially from the legal, information architecture and content management aspects for the developer (Guidelines, 2016), but the main gap of the guidelines is did not include the main issues of websites usability and accessibility problems from end-user, visitors and management perspectives. However, most sections of the Ethiopian statute book were meant to cover matters in the offline context, not based on dynamic portal based digital environment. Most of the legislations are, therefore, outdated and that do not address the present challenges wrought by the dynamic technology changes. This makes it imperative to revisit and access the present e-Government website services usability and accessibility and adapt evaluation model so that could be fit for purpose in the new digital services.

Research is needed to investigate and proposing which usability and accessibility evaluation method can be appropriate for e-Government website/portal. This sort of research can help Ethiopia

e-Government website improving its usability and accessibility of application and in order keeping smooth operation of government electronic activities from different perspectives. Furthermore, the research may provide an opportunity for academia to consider specific usability and accessibility evaluation solutions for e-Government web based electronic services. Scott (2005), states that website usability monitoring is an important component of website quality and government websites developers' must regularly monitor and enhance the quality of their websites to attract and satisfy end users (visitors) as website content and website use increase.

The National ICT Growth and Transformation Plan (GTP) of Ethiopia in its annual report from 2010 up to now, there is no stated report related to e-Government websites usability and accessibility evaluations studies, level of end-user involvement, and its impact assessment from services users' perspectives (FDRE, GTPII, 2016).

According to Teka, et al. (2016) in Ethiopia software usability including portal-based system is neither well addressed in software practice nor at the policy making level. Software practitioners focus on functional requirements, meeting deadline and budget. The report shows that implementation and usability of Ethiopia e-Government services also face many problems and other studies indicate that there is little or fragmented effort to overcome problems related to usability and accessibility of e-Government services based on users' needs and perspectives (Aserat, 2017).

This research study assesses the usability and accessibility of websites. Moreover, the study proposes usability and accessibility evaluation model of Ethiopia e-government websites. Therefore, aims to answer the following research questions:

- What kinds of usability and accessibility problems exist with Ethiopia e-Government websites that violate website development standards?
- How make usable and accessible Ethiopian e-Government websites?
- What kind of websites usability and accessibility model can be proposed in Ethiopian context?

1.3 Objective of the Study

1.3.1 General Objective

The general objective of this research study is to propose Ethiopia e-Government Websites Usability and Accessibility Model (WUAM) for improving the usability and accessibility of the e-Government websites

1.3.2 Specific Objective

- To identify and put forward the usability and accessibility of Ethiopia e-Government websites problems and standards violated by e-Government websites for improving performance.
- To understand and explain usability status of e-Government websites from end-users and management perspectives.
- To improve the e-Government websites user interface and layout design and
- To adapt and propose e-Government websites usability and accessibility model for an effective and easy roadmap of websites in Ethiopian context.

1.4 Scope and Coverage

The scope of this study is to evaluate the usability and accessibility problems of Ethiopia e-Government websites/portals platform, from users and managements perspectives, expert based and automatics tools evaluation. Finally, proposing Ethiopia e-Government website usability and accessibility roadmap model.

It mainly focused on and covers 34 Ethiopian government institutes (Ministries, Agencies and Authorities) portals and websites services. Those are from the e-Government strategy development result of web based informational and transactional E-Services.

1.5 Significance of Research Study

The result of this research revealed the challenges which hinder the usability and accessibility of the Ethiopian e-Government websites and portals. Those in turn to identify key usability and accessibility problems and used to provide a clear picture of what needs to be improves from user and management point of views. The results also help the management, decision makers and developers to assess the factors which contribute positively to the effectiveness and efficiency of the e-Government websites and portals. Thirdly, the results of the study are evaluated and improve the usability and accessibility of the e-Government websites with the proposed model in Ethiopia context.

1.6 Organization of the Thesis

This research report result is organized into six chapters. The first chapter already discussed the background, the problem statement that relates to the research, significance and scope of the study. In the second chapter, literature reviews on general overviews of e-Government, e-Government initiative and country profile, e-Government delivery mode, usability and accessibility of e-Government websites issues and concepts, and description on the methods of websites usability evaluation model and related works is discussed. In the third chapter discussed methodologies, which the researcher has applied to study. In this section the research approach, the research design, data collection and analysis procedures and techniques for usability and accessibility of e-Government websites of the research presented. In the fourth chapter based on the research result the findings are discussed in details from management, users, expert based heuristics method and automatics assessment result presented. In the fifth chapter the proposed model and its component are presented and discussed. Finally, in the sixth chapter of the study summary, conclusion and recommendations, research limitations along with the future research directions are forwarded.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this chapter is to provide general and useful information about Ethiopia e-Government, websites and portal services, and web-based applications and delivery models. Moreover, about e-Government websites usability and accessibility issues are discussed with related studies in usability and accessibility evaluation of e-Government websites in different perspectives and approaches.

2.1 E-Government

The term Electronics Government (e-Government) is defined as “streamlining government by providing efficient and effective services and information to citizens and business through advanced technology” (Kumar et al., 2007, Blackstone et al., 2005).

E-Governance (also called electronic governance) (Belachew, 2010, Gohin & Vindo, 2015) is the public sector’s use of information and communication technologies with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective. E-Government (Lessa, 2015) it is referred to as digital government, online government and even transformational government.

Luo (2015), have defined E-Government as the use of information technology such as computers, networking, and communications to optimize the government organizational structure and work processes, to form a simple and efficient mode of operation without constraints from time, space and separate departments, and to provide high-quality, standardized, and transparent management and services to the public.

2.2. E-Government in Ethiopia

According to MCIT e-Government S.(2011 & 2016) e-Government Strategy and Implementation Plan of Ethiopia includes four key objectives, those are bring the government closer to the people, implementation of effective governance, improve service delivery and benefit

through participation of the private sector and deployment of its resources, entrepreneurship and competence.

2.2.1 E-Government Initiative and Issues

ICT has greatly enhanced the efficiency and effectiveness of the services that many governments around the world offer to the public - thus supporting economic and social development (Kumar, Mukerji, Butt, & Persaud, 2007). From this, the internet is a leading opportunity for governments to offer services to their citizens via websites. Government websites provide a platform for efficient communication and access to public information.

With the expansion of the ICT globally and the major IT initiatives and programs at national level include widespread deployment of electronic government and ICT based initiatives such as Woreda Net, School Net, as well as increasing initiatives to streamline delivery of various services through the medium of ICTs, results many peoples choose to conduct official communications with the government by using the web technology (MCIT Content Regulatory, 2017) (Assefa, 2014). The web technology like electronics service provides various benefits of changing the way people study and becomes a tool for public and private sector organizations provide information and services to citizens and transformation and modernization of public sector organizations

Derived from Ethiopia National Growth and Transformation Plan (FDRE GTP I, 2011 & GTP II, 2016), Ethiopia under the E-Government initiative several projects have been initiated including mobile solutions, like web based informational and transactional E-Services, E-Procurement, Human Resource Management System, E-Office, E-Mail and Financial Management Information System. Likewise, wider application of E-Government, e-learning, e-library, mobile banking and others have enabled to improve the quality and efficiency of public and private services.

Now a day with the increasing of webs-based e-Services providers' and users', there usability and accessibility were becoming the major issues. The concept of usability has gradually extended too many other areas. The World Wide Web (www) provides access to the vast amount of information available on the Internet. Web applications have affected several domains, providing information and services for a variety of users with different backgrounds and characteristics.

Because the main task of the website is to help users to find desired information and services easily, the contents should be organized in a way that brings users access and navigation. In addition, the contents should be placed with a well-structured layout. In short, the acceptability of websites by users relies on web usability (Simin, 2015).

According to (Nielsen J. , 2012), a product that performs at a high level in every quality component will have high usability. It can be considered that usability issues are quality standard whether a product is effective, easy to learn, efficient and makes few errors and satisfies users.

2.2.2. E-Government Portal

Based on the MCIT e-Government (2011) E-Government Strategy and Implementation Plan, the E-Government Portal can be the integration point and a one-stop shop for all government services like [/www.ethiopia.gov.et/](http://www.ethiopia.gov.et/). It can also act as a linkage between the other delivery channels. The major advantage of portal is:

- User friendly services available at a single location for anywhere, anytime access.
- It requires minimal human intervention and enables interactive service delivery.
- Easier to remember one URL than a number of different URL's for each department,
- Presents single face of the government
- Leads to higher usage of website services as users of already existing services get information regarding new e-Services while transacting
- Internet is a cost effective and convenient means for providing information about services, rules and regulations ...etc.

2.2.3. Ethiopia E-Government websites, e-Services and applications

Ethiopian National Growth and Transformation Plan (FDRE, GTPII, 2016) report indicates that 126 informational services and 164 transactional electronics services have been developed by MCIT (during the GTP I and GTP II plan period). Likewise, wider application of E-Government, e-learning, e-library, mobile banking and others have enabled to improve the quality and efficiency of public and private services (FDRE, GTPII, 2016).

Some of the MCIT E-Government portals, e-Services and applications are listed below:

- Ethiopian government portal (www.ethiopia.gov.et) is a one-stop shop multi-lingual national government portal for online services that provide information, interactive and transactional services. The national portal provides information and services which are created and maintained by various government organizations. These ministries and agencies use their portals to deliver information and transactional services to citizens: www.mcit.gov.et, www.moe.gov.et, www.moh.gov.et, www.mofec.gov.et. ... etc
- Ethiopian eService Portal (www.eservices.gov.et) is designed to provide a common platform and generic tools for online transactional services. Using the system, government organizations render electronic public services to citizens, non-citizens, businesses, and government and non-governmental organizations.
- Ethiopian Open Data Portal (www.data.gov.et) is about releasing public data to help people understand how government works and how policies are made.
- Electronic Government Procurement System (www.eprocurement.gov.et) is developed in compliance with the Ethiopian Government Procurement Legislative Framework and B2G and G2G best practices. The e-Procurement system provides the ministry with a platform to transact with suppliers as well as within its own organizational departments.
- Ethiopian Customer Compliant Portal (www.ecompliant.gov.et): Complaints and suggestions are valuable sources of feedback for any government institution. The system provides governmental institutions and citizens with a common platform to interact with each other regarding the state of public service provisions.
- FDRE Mobile App Store (www.apps.gov.et) is a national apps distribution platform for Governmental apps and apps developed by citizens. The service allows users to download locally or users can access apps in Google Play and Apple App store.
- E-Learning Portal (www.elearning.gov.et) is the use of technology to connect trainer and trainees who are physically miles apart. The training can be delivered by web technologies (both internet and intranet) and
- Other Federal and Regional Government organizational websites and portals are developed and having already been used.

2.2.4. Ethiopia E-Government Survey Report

Ethiopia is a republic situated in East Africa. It has an estimated population of 94 million (ECSA, 2017¹). Base on the national operator of Ethio-Telecom report in 2017, data and internet subscriber number of the country is 16,505,225 (18% of the total population) and Mobile telephone subscriber is 58,080,626, which is 62% of the total population. In addition, it provides dialup Internet, CDMA 2000 wireless Internet, ADSL and wireless Internet using AIRONET, VSAT, and EVDO. It uses VSAT technology for the delivery of services to various government networks such as WoredaNet, SchoolNet, AgriNet and to non-government organizations.

One of the most widely used measures of E-Government diffusion is the E-Government Development Index (EGDI) which was composed by the UN through the UN E-Government Development Surveys as shown the survey report in table 2.1.

Table 2.1: Ethiopian E-Government Development Status

Year	Indices indicators (EGDI)	Rank out of 191 Countries
2003	0.128	166
2004	0.1365	170
2005	0.1360	171
2008	0.1857	172
2010	0.2033	172
2012	0.2306	172
2014	0.2589	Middle E-Gov't Dev't Indexes
2016	0.2666	157

Source: United Nations E-Government Surveys (2003-2016)

The level of Ethiopia in E-Government Online Service Index (OSI) is between 0.50 and 0.75 (UN, E-Government Survey, 2016). The highest performing countries in OSI (from 0.75 to 1), include 15 countries from Europe, 8 from Asia and 6 from the Americas (United Nations E-Government Survey Report, 2016).

2.2.5. UN e-Readiness Index

The UN e-readiness Index is evaluated based on the web maturity, infrastructure and human capital available in the country. Ethiopia has made significant progress in the web measure index over the years but the infrastructure component of the index has been relatively low (UNPAN, 2005).

¹ <http://www.csa.gov.et/monthly-retail-price/category/341-cpi-2017> (Accessed: April 2018)

The United Nations E-Government Surveys Report (2003-2016), show that, Ethiopia is far reaching in use and apply internet which is pre-request for interactive e-Governance platforms, compare to its population and other African countries. Despite its low of ranking in e-Government readiness and at the merged stages of web-based technology in Ethiopia; the number of web users continues to grow in the country. ²Therefore, it is advisable for the Ethiopia government to create usable and accessible government websites to improve communication with its citizens.

2.3. E-Government Delivery Models and Activities

According to Pulinat (2011) and Abdullah (2011), e-Government delivery models and activities are subdivided into the following categories:

1. Government-to-Citizen/Consumer

Government-to-Citizen (G2C) services enable citizens to interact with the government through a single window. Through electronic computer portals that host application forms, legislation, news and assorted information or other new methods communication medias like emails or media campaigns. Citizens can have access to government processes and representatives. This research focused on G2C, citizen-centered e-Government websites/portals, by evaluated Ethiopia government organization websites and portals.

2. Government-to-Business

Government-to-business (G2B) represents the interactive relationship between the government (local or central) and the corporate bodies and organizations of the private sector.

3. Government-to-Government

Government-to-Government (G2G) is the backbone of E-Government. This sector believes in updating their own internal systems and procedures before commencing electronic transactions with citizens and businesses. This sector involves sharing of data and improving collaboration between central and local governments.

² <http://www.csa.gov.et/monthly-retail-price/category/341-cpi-2017> (Accessed: April 2018)

4. Government-to-Employees

Government-to-Employee (G2E) solution is about equipping government employees to support the citizens in much better and faster way, speeding up their internal administrative processes and devising the optimal solutions.

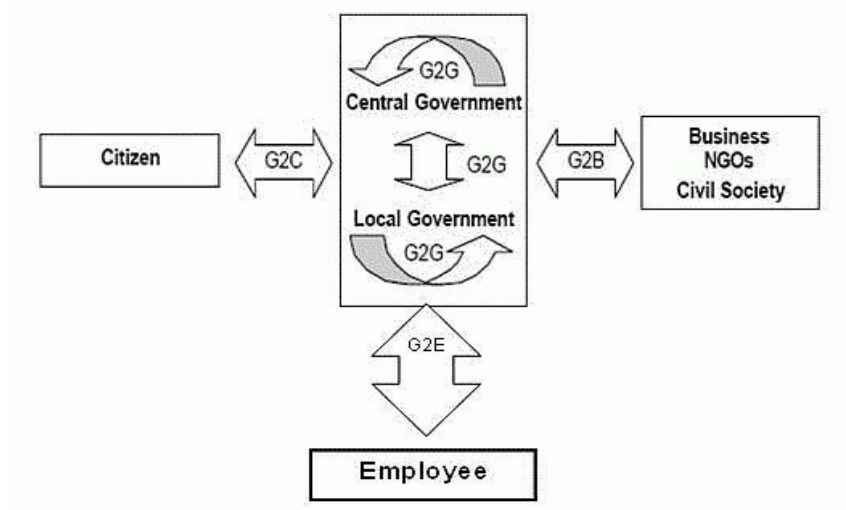


Figure 2.1 Delivery models of E-Government (Pulinat, 2011)

2.4. Usability and Accessibility of E-Government Website

The World Wide Web (WWW) has having a significant impact on the access to the huge quantity of information available through the internet. Web-based applications have influenced several domains, providing access to information and services by a variety of users showing different characteristics and backgrounds (Maristella, Francesca, & Giovanni, 2013).

Users visit websites, and also return back to previously accessed sites, if they easily find useful information, organized in a way that facilitates access and navigation, and presented according to a well-structured layout. In few words, the acceptability of web applications by users strictly relies on their usability, because it is one relevant factor of the quality of web applications (Maristella, Francesca, & Giovanni, 2013).

Website usability has also been a problem for e-Government development. Likewise, many developing countries e-Government systems are mostly characterized by poor usability. Consequently, advancing e-Government in Sub-Saharan Africa including Ethiopia necessitates

advancing the usability of current e-Government systems in the region, as usability has been shown to be a vital precondition for e-Government progress (Verkijika S. F., 2017). As such, this study had as focus objective to develop a model for improving the usability and accessibility of e-Government websites in Ethiopia.

Although international guidelines on webpage development are provided by World Wide Web Consortium (W3C, 2009), to help website administrators develop usable websites, these guidelines are not often followed (Gwardak & Pålhlstorp, 2007). For example, (Parajuli, 2007) evaluated 17 websites of the Nepal government, results regarding usability show that it was not so easy to navigate or search information on the Nepal government websites, because only 35 percent of websites provided a site map and 29 percent provided a search engine.

2.4.1 Definition and Component of Usability

The most widely adopted definition of usability is provided by the International Standards Organisation (ISO). ISO-9241-11(1998) Define usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction, in a specified context of use”. It is also addressed in the standard as “the capability of the software product to be understood, learned, and liked by the user, when used under specified conditions”

In accordance with the ISO definition, e-Government Usability defines as “***the extent to which a website can be used by citizens to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified e-Government service context.***”

In developing countries there are gap between demand and supply of e-services, thought to be the result of a lack of achieving the user’s real needs and expectations, including the usability of e-services. The insufficient developments of e-Government are stand behind not achieving e-Government objectives in the developing countries (Bader, 2011). Therefore, usability has been known to play a central role in the success of any e-Government initiative (Verkijika S. F., 2017).

Another important view of usability was presented by Nielsen (1994), in which he explained usability as the quality attribute of a system that examines how easy it is to use the system. Nielsen (2012), further defined usability in terms of five key quality components as listed below.

- **Learnability:** How easy is it for users to accomplish basic tasks the first time they encounter the design?
- **Efficiency:** Once users have learned the design, how quickly can they perform tasks?
- **Memorability:** When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- **Errors:** How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- **Satisfaction:** How pleasant is it to use the design?

Bander (2011) declared that usability is a problem for websites and in usability tests 34% of users could not manage to achieve an assigned task at a particular website and there are some examples of usability problems in terms of value, navigation, presentation and trust. Therefore, quality of usability is an important role in making the user decides to leave or use a website. This definitely relies on usefulness of the presented information and the nature of the current information; is information readable, brief and not boring. With regard to the structure, the user looks for a clear, straightforward, good appearance and well-organised website.

2.4.2 Definition and Component of Accessibility

Similar to usability, accessibility is a term for which there is a range of definitions. It usually refers to the use of websites or E-Systems by people with special needs, particularly those with disabilities and older people. ISO 9241-171 (2008b) defines accessibility as:

“The usability of a product, service, environment or facility by people with the widest range of capabilities”

This definition can be thought of as conceptualizing accessibility as simply usability for the maximum possible set of *specified users* accommodated; this fits within the *universal design* or *design for all* philosophy (Helen & Nigel, 2009). However, the Web Accessibility Initiative (WAI), founded by the (W3C, 2009) to promote the accessibility of the Web, defines web accessibility to mean:

“That people with disabilities can use the website. More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the web”

According to Yakup and Kemal (2016), Web accessibility can be defined as the degree to which a website is accessible to the largest possible range of people. The more people are able to access a website, the more accessible is the site. At its core, Web accessibility emphasizes making website accessible to persons with disabilities.

However, as an accessible website is designed to meet different user needs, preferences, skills and situations, this flexibility can also benefit people without disabilities in certain situations, **“such as people using a slow Internet connection, people with temporary disabilities such as a broken arm, and people with changing abilities due to aging”** (Yakup & Kemal, 2016)

Generally, on the top of discussions and factors of usability and accessibility, to moving forward and building a productive e-Government websites and portals, pointed out that more usable and accessible websites indicate that, a country is heading towards the full implementation of e-Government services.

2.5. Usability and Accessibility Evaluation Methods

Usability and accessibility evaluation methods generally refer to the different techniques, or set of systematically designed activities, for collecting and analysing data regarding user interaction with a system, or how given attributes of a system help to attain a given level of usability and accessibility (Verkijika & De Wet, 2016).

There have been an increasing number of studies on the evaluative methods which focus on analyzing the web usability problems. The main goals of evaluation are to assess the application functionality, to verify the effect of its interface on the user, and to identify any specific problem with the application, such as aspects which show unexpected effects when used in their intended context (Dix, Finlay, Abowd, & Beale, 1998).

Evaluating web applications in particular consists in verifying if the application design allows users to easily retrieve and browse contents and invoke available services and operations (Maristella, Francesca, & Giovanni, 2013). This therefore implies not only having appropriate contents and services available into the application, but also making them easily reachable by users through appropriate hypertexts.

Evaluation methods are mainly aimed on assess the application functionality, to verify the effect of its interface on user, also to identity any specific problem with the application such as aspects which show unexpected effects when used in their intended context (Joel & Titus, 2015). Also evaluating website applications in particular consists of verifying if the application design allows users to easily retrieve and browse content and invoke available service and application they need. This therefore implies not only having appropriate contents and service available into the application but also making them easily reachable by users through appropriate hypertexts.

However, the development of a web system is a continuous process with an interactive life cycle of analysis. When researchers focus on website evaluation methods, website can be measured manually or automatically by the website evaluation methods (WEMs), based on some criteria so as to achieve quality website. Some of website evaluation methods according to Joel & Titus (2015), could be:

- i. User-based usability evaluation methods
- ii. Evaluator-based usability evaluation methods and
- iii. Automatic website accessibility evaluation tools

2.5.1. User-based Usability Evaluation Methods

Process of design for usability, user testing and redesign is called user centered design (Nielsen J. , 1993). According to Joel & Titus (2015), the user evaluation approach consists of set of methods that employs representative user to execute some tasks on specific system. The user performance and satisfaction with the interface are then recorded. User Testing, when users use the system they normally work towards accomplishing specific goals in their minds. User should be able to do basic tasks correctly and quickly. It is important to test users individually and let them solve the problems on their own.

User testing provides reliable evaluations, because it involves samples of real users. It allows evaluators to overcome the lack of precision manifested by predictive models when the application domain is not supported by a strong and detailed theory (Verkijika & De Wet, 2016).

Such a method, however, has a number of drawbacks. It is difficult to select a proper sample of the user community: an incorrect sample may lead to wrong perceptions about the user needs and preferences. It is difficult, in a limited amount of time, to train users to master the most sophisticated and advanced features of a Web application; not well-trained users may produce “superficial” conclusions, only related to the most immediate features of the application. Failure to reproduce such a context may lead to “artificial” conclusions rather than to realistic results (Maristella, Francesca, & Giovanni, 2013).

The other downside to user-based methods is the fact that they are very time-consuming and costly when many users are required. Actually, the purpose of usability study is to test the system and not the users, and this aspect must be explicitly explained to tested users (Nielsen, 1993, (Joel & Titus, 2015).

2.5.2. Experts-based Usability Evaluation Methods

Experts inspect the interface and assess system usability using interface guidelines, design standards, users’ tasks, or their own knowledge, depending on the method to find possible user problems (Joel & Titus, 2015). Moreover, the inspectors can be usability specialists or designers and engineers with special expertise. In this category, there are many inspection methods such as cognitive walkthrough, guideline reviews, standard inspection and heuristic evaluation.

According to Verkijika et al. (2016), some of the most widely used experts-based evaluation methods include heuristic evaluations, cognitive walkthroughs, pluralistic walkthroughs, guideline reviews, and consistency inspection. These different methods are briefly below³:

- **Heuristic Evaluation:** is a usability evaluation method whereby usability experts or other stakeholders appraise a user interface based on some set of predefined rules or principles. The ten heuristics by Nielsen (1995) are the most widely used set of heuristics in usability. While Nielsen's ten heuristics primarily addressed general website usability, they have, however, been adapted and extended in the domain of e-Government to address the specific issues relevant to e-Government websites.
- **Cognitive Walkthroughs:** A cognitive walkthrough design of a user interface with a key focus on how easy the interface is to learn, or in other words, how well the system supports exploratory learning. Cognitive walkthroughs generally focus on examining the usability problems those users of a system might experience in their process of learning to use the system and/or completing tasks.
- **Pluralistic Walkthroughs:** A pluralistic walkthrough involves both users and members of a product team examining and discussing usability issues of a system interface with regards to the steps to take in completing a task. Pluralistic walkthroughs are always guided by a facilitator who presents the interface and initiates discussions. Pluralistic walkthroughs are very similar to cognitive walkthroughs, with the primary difference being the comprehensiveness of the evaluation team. The evaluation team in a cognitive walkthrough comprises of only human experts. However, in a pluralistic walkthrough, the whole project team, including managers, engineers and programmers, form part of the evaluation team.
- **Consistency Inspection:** Consistency inspection usually involves system designers from multiple projects who inspect a given system interface to determine if the interface works in a similar manner to their own interfaces. The focus is, therefore, to check for consistency across a family of previously evaluated products. Thus, if a system performs consistently with one that had been previously tested and approved in terms of usability, then the system is also likely to have high usability.

³ Usability inspection methods, <http://www.usabilityhome.com> (accessed on March 26, 2018)

Since, we are discussed all the expert-based evaluation methods i.e. heuristic evaluation, cognitive walkthroughs, pluralistic walkthrough and consistency inspection, in the above section, usability testing through heuristic evaluation principle were chosen for this research as the most suitable. As for the heuristics, several usability studies have made reference to Nielsen and Pearrow's usability heuristics (usability guidelines). The guidelines consist of a combination of rules that allow assessing of all possible websites.

Nielsen (2006), made a set of usability heuristics for user interface design which consists of the summarized ten “golden rules” proposed for the design and evaluation of interactive systems using Nielsen's heuristics ⁴ for expert-based evaluations usability problems.

2.5.3. Automatic Website accessibility Evaluation Tools

Similar to heuristic evaluations, automated usability testing methods also follow a set of predefined guidelines developed by experts. The key difference compared to heuristic evaluation is that instead of human users evaluating the interface against the guidelines, the evaluation is done by a software system.

Automatic tools are software that automates the collection of interface usage data and identify potential websites problems. First study was conducted by Maristella et al. (2013), who concluded that more research was needed to validate the embedded guidelines and to make the tool usable. Automated usability tools often receive input (e.g. an interface or data), perform the required analysis, and present the results.

Website professional cannot rely on them alone to improve websites context (Joel & Titus, 2015) mentioned several kinds of Web testing tools that can be used: accessibility tools such as Bobby, usability tools such as LIFT, performance tools such as TOPAZ, Security tools such as Web CPO, and classifying website tools such as Web Tango.

The World Wide Web Consortium (W3C) is an international organization dedicated to the standardization of the World Wide Web (WC3). In 1996, W3C established the Web Accessibility

⁴ The Ten Nielsen's heuristics: <https://nngroup.com/articles/ten-usability-heuristics/> (accessed: Jan 25, 2018)

Initiative (WAI) campaigning for a more accessible Web for persons with disabilities. The Web Accessibility Initiative (WAI), a Project by the World Wide Web Consortium (W3C) published the Web Content Accessibility Guidelines (WCAG) version 1.0/2.0. These guidelines were widely accepted in many countries around the world as the definitive guidelines on creating accessible websites (Yakup & Kemal, 2016).

W3C disability accessibility criteria are accessed via online tools that verify the website compliance to the WCAG 2.0. Compliance to the WCAG 2.0 indicates that the website is fully functional for the usage of Disabled persons. The Most Common Automated Website Accessibility Tools are:

- **WAVE accessibility evaluation tool**⁵: is an online tool for the accessibility analysis of web sites based on the W3C WCAG⁶ 1.0 and WCAG 2.0 (Solomon & Ibrahim, 2016). Its goal is to analyze the level of accessibility in the design and development of web pages to allow access for all, regardless of their specific characteristics.
- **www.w3.org developer tools**: is an open source web analyzers tools gives online services that help determine if web content meets accessibility guidelines, www.w3.org⁸.
- **Web Accessibility Tester (TAW)** is an online tool for the accessibility analysis of web sites based on the W3C WCAG 1.0 and WCAG 2.0. Its goal is to analyze the level of accessibility in the design and development of web pages to allow access for all, regardless of their specific characteristics, and automatics online open source online website accessibility analyzers tools are presently used for accessibility testing and analysis (Solomon & Ibrahim, 2016).

⁵web accessibility evaluation tool: accessed from <http://wave.webaim.org/> (Oct 10/2017)

⁶WCAG 1.0 : Web Content Accessibility Guidelines

⁷w3.org, (2018): Retrieved February 7, 2018, from <https://www.w3.org/developers/tools>: W3C: World Wide Web Consortium Website

⁸w3.org, (2018): Retrieved February 7, 2018, from <https://www.w3.org/developers/tools>: W3C: World Wide Web Consortium Website

2.5.4. Mixed Methods

Mixed methods can highly benefit from the incorporation of different methods research evaluations, especially in enhancing the research rigour with regards to the creation and evaluation of the artifact (Agerfalk, 2013). Mixed methods research is adopted and incorporated in this thesis study process using user-based evaluation, heuristic evaluation and automated testing.

Mixed method research brings together a combination of quantitative and qualitative research designs in the same study (Agerfalk, 2013). The mixed methods research was developed in order to address some of the inherent limitations of using only one of the methods, and as a means of ensuring that more holistic results could be obtained. In this research study also uses mixed research technique of users, expert and automatics' tools evaluation approaches.

2.6. Related Works

The introduction of the website technology, research in website usability has been on increase and received more and more attention from organizations and researchers. As well the increasing importance of the development of e-Government services, there are growing interests of research of usability and accessibility measurement in website. Currently, many international research institutes have tried to build an evaluation system for e-Government websites, especially evaluating the performance of e-Government portals (Wan et al., 2011). Usability of a system is indicated with ease of learning, efficient to use, easy to remember, low usage error rate and pleasant to use (Nielson, 1994).

Prior study in the area of website evaluation for the government of Uganda by Edgar & Nena (2010), the authors investigates usability of government websites using the feature investigation method. The study evaluated four Ugandan government websites with three perspectives. Results show that websites are partially usable in the design layout and navigation perspectives but are rather weak in stating legal policies. The final evaluation results provided the Ugandan government with a clear picture of what needs to be improved according to international website design standards.

Solomon & Ibrahim (2016) conducted a research on the evaluation of accessibility and performance analysis of the state government websites in Nigeria by using two online automated tools: Web Accessibility Tester (TAW) and site analyzer. Results from the study show that none of the websites evaluated totally conform to Web Content Accessibility Guidelines (WCAG) 2.0 standard. Also, the overall performance obtained shows that most websites tested are above average.

Studies conducted by Wan et al. (2011), on the Usability and Accessibility assessment of Malaysia E-Government Website. The study was used the usability measures are being measured by using Nielson usability guideline. Samples of 155 Malaysia e-Government websites were selected from federal government websites and state government websites available at <http://www.malaysia.gov.my>. The websites were analyzed by using several automatic evaluation tools such as Website optimization, Axandra and Eval Access 2.0 tools. The findings reported by the authors may alert web developer and other stakeholder to give more emphasis on specific accessibility and usability features which are often being neglected.

A case study research was done by Simin (2015), on Usability of E-Government Portals in China, for the Hubei province portal's www.hubei.gov.cn . In this study applies a qualitative research method. The research was use the heuristic evaluation method to evaluate the usability of an e-Government portal. Finally, the author identified the usability issues and some recommendations for the future construction of e-Government portals were proposed.

According to Verkijika S.F.(2017), research study report on the evaluation and improvement of the usability of e-Government websites in Sub-Saharan Africa (SSA) for enhancing citizen adoption and usage, with the objective of to develop and test a model for improving the usability of e-Government websites. In order to achieve this goal, the design science research (DSR) approach was used. This research approach was further supported by mixed methods encompassing usability evaluation (heuristic evaluation and automated testing) and cross-sectional analysis of national indicators.

Since the initiation of the web, research in website usability has been on the increase both in developed and developing countries. There has been study which focused on the investigation of the usability and content accessibility of UK e-Government websites. Based on automatic

evaluation results of the study, ten selected websites were further evaluated with expert evaluation methods: heuristics evaluation and cognitive walkthrough. Assistive technology was also used. The results show a relatively high compliance with the web content accessibility guidelines and a relatively low usability rating for most UK e-Government websites (Hoi-Yan & Panayiotis Zaphiris, 2003).

Bader (2011) has conducted his PhD thesis on influencing factors that act as barriers and critical success factors to e-Government websites usability problems in Jordan. The research focuses on the usability of e-Government websites in Jordan as a case study, as it is one of the developing countries facing problems due to websites usability. Finally, the researcher proposes a roadmap to reinforce websites usability. The researcher made three stages research procedures; the first stage investigated the level of usability from a manager's perspective, second from an end-user's perspective and the outcome from the early mentioned stages studies was used in the third stage, which has been used to establish the model. In this research study considers end-users assessment, this used to recognize one of the problems of e-Government websites and prepared guidelines face were not understanding or ignoring the users' needs, which will negatively affect the usability of websites further inhibit e-Government implementation. These issues are more significant in developing countries (Elsheikh, Cullen, & Hobbs, 2008).

Noe (2017) has studied the Usability, Accessibility and Web Security Assessment of e-Government Websites in Tanzania. Using several automatic diagnostic (evaluation) tools such as pingdom, google speed insight, wave, w3c checker and acunetix, this study assesses the usability, accessibility and web security vulnerabilities of 79 selected e-government websites in Tanzania. The results reveal several there is high number of usability problems of websites were found to have broken links and websites have loading time of more than five (5) seconds for their main page. The accessibility results show that all 79 selected websites have accessibility errors and violate w3c WCAG 1.0. The results on web security vulnerabilities indicate that 50.6% assessed websites have one or more high-severity vulnerability. Based on these results, this study provides some recommendations for improving the usability, accessibility and web security vulnerabilities of public institutions in Tanzania.

➡ **Summarizing of the related works has been presented in the table 2.2, below.**

Table 2.2 Summary of Related Works

Author and Year	Study Title	Objective/ Purpose	Approaches/ Methodologies	Key Findings
Edgar Napoleon Asimwe and Nena Lim, (2010)	Usability of Government Websites in Uganda.	The objective of this paper is to examine the usability of government websites in Uganda.	Using expert-based evaluation approaches, with three categories of 14 website features were examined, namely: design layout, navigation, and legal policies.	An evaluation of four government websites showed fair results. The average score of inspected features is about 46 percent. In short, all websites have clear and unique addresses but 6 out of 14 features were missing.
Solomon Adelowo Adepoju and Ibrahim Shehi Shehu (2016)	Accessibility Evaluation and Performance Analysis of E-Government Websites in Nigeria.	The aim is to test for their conformance with the Web Content Accessibility Guidelines (WCAG).	Using two online automated tools: Web Accessibility Tester and site analyzer.	Results from the study show that none of the websites evaluated totally conform to Web Content Accessibility Guidelines (WCAG) 2.0 standard. Also, the overall performance obtained shows that most websites tested are above average.
Wan Abdul Rahim Wan Mohd Isa, Muhammad Rashideen Suhami, (2011)	Assessing the Usability and Accessibility of Malaysia E-Government Website	The main objective of this study is to investigate the usability and accessibility of Malaysia E-Government websites.	155 Malaysia e-Government websites were selected, and analysis using Nielson usability guideline and automatic evaluation tools such as Website optimization, Axandra and Eval Access 2.0 tools.	The findings make aware web developer and other stakeholder to give more emphasis on specific accessibility and usability features
Simin Luo, (2015)	Usability of E-Government Portals in China, Lahti University of Applied Sciences	The purpose of this thesis was to evaluate the usability of E-Government portals in China.	This study applies a qualitative research method. The expert based heuristic evaluation method to evaluate the usability was applied.	The identified usability issues were related to unclear website structures, inconsistent style and layout, unified navigation, and the unspecified page titles. Finally, proposed some suggestions which can serve as a reference for the future designing of website
Verkijika Silas Formunyu (2017)	Evaluating and Improving the Usability of E-Government Websites in Sub-Saharan Africa for Enhancing Citizen Adoption and Usage.	The study objective is to develop and test a model for improving the usability of E-Government websites in Sub-Saharan Africa (SSA).	Adopted a combination of design science research and mixed method of evaluations. The study applied heuristics evaluation, automated testing methods and cross-sectional analysis of national indicators. Evaluating 279 e-Government websites usability from 31 SSA countries.	Using a six-dimensional framework for assessing the usability of e-Government websites in SSA, the study concluded that, SSA e-Government websites were currently characterized by poor usability. The average usability score for the websites was 36.2%.

Author and Year	Study Title	Objective/ Purpose	Approaches/ Methodologies	Key Findings
Bader Methqal AlFawwaz (2011)	Evaluation of E-Government Websites Usability in Jordan.	The main aim of this research is to investigate the situation of the Jordanian e-government websites, with a view to improve their usability and propose roadmap to reinforce websites usability for better utilisation	This research work has been accomplished through three stages: first from a manager's perspectives, second from an end-user's perspectives and third stage, by establishing a model to improve the usability.	The findings from the studies reinforce the existing body of knowledge and they are applicable not only in Jordan, but also to those of other developing countries and presentation of the model (roadmap) to help people in order to make user friendly websites.
Dinesh Katre and Mayankana Gupta (2012)	Expert Usability Evaluation of 28 State Government Web Portals of India	This paper presents the usability evaluation of 28 state government web portals of India based on the evaluation of 79 parameters grouped under 7 broad categories such as accessibility, navigation, visual design, information content, interactivity, ownership and branding.	The expert usability evaluations were used based on a balanced mix of parameters which also reflect the quality of governance in the particular state.	The state web portals are ranked based on compliance with the overall usability parameters.
Vera Silva Carlos, Ricardo Gouveia Rodrigues (2012)	Web site quality evaluation in Higher Education Institutions	The main goal of the study is to evaluate Web site quality through the user's perspective, specifically the quality of Web sites belonging to Higher Education Institutions (HEI), through the students' perspective.	Used Aladwani's and Palvia's instrument, which evaluates quality from the user's perspective.	The main finding of the study is that HEI aren't committed to using the Web site as an effective marketing tool and, therefore, much work still needs to be done.
Noe Elisa (2017)	Usability, Accessibility and Web Security Assessment of E-Government Websites in Tanzania	The main objective of this study is to assess the usability, accessibility and web security vulnerabilities of selected Tanzania E-Government websites.	Using automatic diagnostic tools, such as pingdom, google speed insight, wave, w3c checker and acunetix, assess 79 selected E-Government websites in Tanzania	The results reveal several issues on usability, accessibility and security of Tanzania E-Government websites.

As shown in summary of related works above, currently in many countries e-Government websites usability and accessibility assessments have been done, using different methods and approaches. These makes to identifies their countries websites usability and accessibility problems and also improves users' interfaces, layout design and functional features. Therefore, those related

studies' ways of research methodology, identified gaps, and designed and proposed solutions models were used as an input for this research.

2.7. Proposed Model for Improving the Usability of Jordan e-Government Websites

As stated in the related study of evaluation of e-Government websites usability in Jordan Bader (2011), the main aim was the Jordan e-Government websites model to improving their usability's and to achieve a successful e-Government project in Jordan. When successfully applied, the e-Government website can be usable and achieve the main goal of implementing an e-Government project. According to Bader (2015), The model can also be used by developing countries that might share the same culture and situation, with minor implementation or modifications. Therefore, for this study the proposed models are adapted from Jordan e-Government websites usability model.

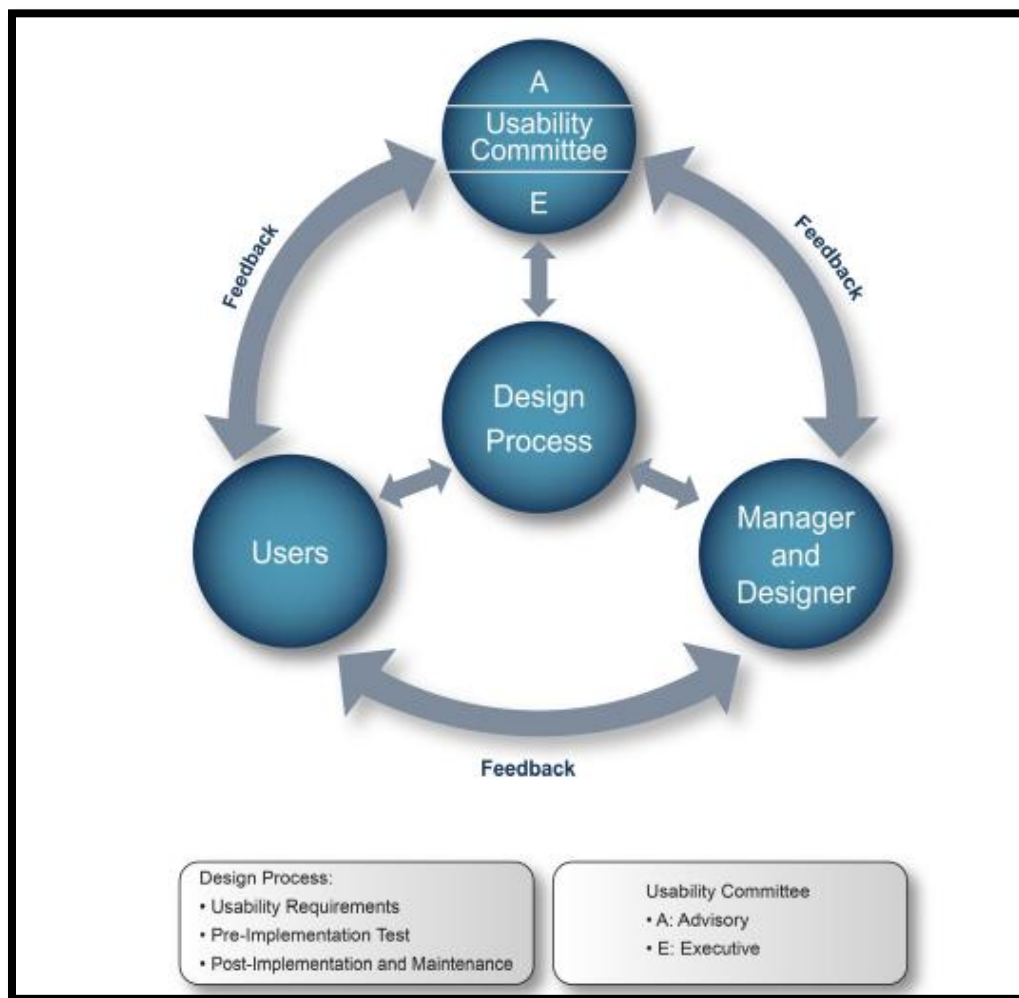


Figure 2.2 The Proposed Model for Improving the Usability of e-Government Websites in Jordan, Bader (2011)

The following subsection explains the roles of the components and demonstrates how they contribute to the model.

1. Website Manager and Administrator

One of the main elements concerning the usability of e-Government websites in Jordan website models includes the roles of website managers and expert designers. Website managers in Jordan should have certain characteristics, therefore they should have a reasonable level of experience, knowledge, good communication skills and competence in order to participate in an e-Government website's success. In addition, the website manager should supervise the designing unit regardless if it is from the government staff or a third party from outside the government to ensure they accomplish their tasks properly.

The designers involved should also be considered to be experts in usability issues and it does not matter whether they are government staff or third party as long as they have a good working knowledge of web usability.

According to Bader (2011), during the construction process, it is required that a website manager and the designers communicate effectively with information concerning building the websites in time.

2. Users' Feedback

Based on the Jordan website usability model, focusing on the feedback of end users is important due to the conducted studies revealing that the e-Government project in Jordan did not pay significant attention to the end user requirements before establishing the websites or even after launching them.

Follow the proposed model and obtain users' feedback is considered as an essential base that can provide an accurate perspective of the way a prospective user sees the eGovernment websites in Jordan in terms of usability, in order to make any improving if necessary.

3. Usability Committee

According to Bader (2011), the model suggested that there is a need to create a usability committee which consists of advisory members and executive members. The advisory is suggested to be controlled by responsible government body such as the Ministry of Information and Communications Technology. As for the executive, it does not matter whether is from government

staff or third party (hired from outside) as long as it has expertise and good knowledge in the eGovernment issues in general and in the usability issues in particular.

This committee would not only serve to strengthen the website's overall effect but would also explore effective ways to provide recommendations and to implement the enhancements. The committee (advisory) should consist of members who have expertise and/or interest in website usability, as well as managers from website administration and might contain designers. In addition, it should involve people who have an interest in e-Government projects, as this will help the committee understand the community views. It is expected that all members of the committee will have a working knowledge of the e-Government program, and/or experience in developing effective usability controls (Bader, 2011).

The usability committee will provide suggestions and recommendations according to usability principles and feedback from end users, with the goal of making websites easier to use, more effective and more pleasant for users. Moreover, as conducted studies revealed that there is a lack of budget, unlike other models, the idea of having a committee will help in cutting the cost through offering training to the staff about usability and promoting their awareness.

4. Design Process

The design process includes usability requirements, pre-implementation test and post-implementation and maintenances. According to the Jordanian context, the key problems facing end users of the e-Government management project are navigation, search, lack of customization and appearance. Therefore, this model focuses on these requirements as well as on the overall satisfaction of the website.

In the pre-implementation testing a website before its launch one can ensure it is meeting its full potential. If during the testing users can use it without any problems, one has reached the goal. This ensures that the best available testing method has been performed and the ultimate goal of a usable website can be achieved. User-Centre Design approach, which the model has been recommended to be applied in the pre-implementation test, consists of many techniques (Bader, 2011).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

The purpose of this chapter is used to presents the methodology that is used to achieve the objective of the study. First, general research strategy and design are described. Next, research techniques with four stages of evaluation with different perspectives data collection procedures are discussed. Finally, population of the study, sampling techniques, sample size, data collection instrument and procedure, pilot study and data analysis methods are discussed.

3.1 Research Strategy

In order to address this research aim, the researcher used different sides and perspectives evaluation strategy to obtain a clearest possible usability and accessibility issues and to propose usability method. First, management and users' perspectives data collection were done. Then to get experts' point of view regarding the usage of e-Government websites in a better way, expert based have used the ten Nielsen's heuristics principle (Nielsen, 2006). Moreover, using automatic accessibility evaluation tools the interfaces were reviewed and accessibility testing was done. The general research strategies and methods were used in gathering the needed information include the following:

- Through questionnaire from IT managements and senior e-Government project coordinator experts, who able to provide information on e-Government services and from users, clients and visitors to obtain a real-world sense of the context on the issue of Ethiopia e-Government websites usability;
- Through interview with executive's IT management actively involved in the issue of e-Government (all sides and perspectives);
- Conduct expert-based information gathering using heuristic evaluation principles and
- Carry out automatic accessibility evaluation tools to obtain the clearest possible picture of e-Government website services accessibility problems.

3.2 Research Design

In this study, applied research was used with the aim of identifying the basic usability and accessibility issues of Ethiopia e-Government websites for the purpose of obtaining information to help resolve a usability problem of e-Government websites. According to C.R. Kothari (2004), applied research aim is to discover a solution for some pressing practical problem or to arrive at a solution for a given problem.

The researcher has used mixed methods of research that advances the systematic integration or mixing of quantitative and qualitative data within a single investigation or sustained program of inquiry (Jennifer & John W, 2013). Mixed methods can highly benefit from the incorporation of different research methods evaluations, especially in enhancing the research rigours with regard to the creation and evaluation of the artifact (Agerfalk, 2013). The mixed methods is used in order to reflects detail participants' point of view, to address some of the inherent limitations of using only one of the methods and as a means of ensuring that more holistic results could be obtained and together to gain a more complete understanding of our research questions.

In this study the key issues of e-Government websites usability and accessibility, based on different principles have been investigated. Through qualitative research type we can analyses the various factors (issues) which motivate people to behave in a particular approach of e-Government web-based services or which make people like or dislike a particular standard of website. Moreover, quantitative research approaches are also used for generating statistical analysis, in the process of identifying usability and accessibility issues, for example when metrics of usability (such as numerical values for the number of errors and time it takes to do certain tasks) are set up and then evaluation reveals if the software is as usable and assessable as their designers would like it to be (Creswell, 2003).

3.3 Research Techniques

As indicated previously, the study was based on Ethiopia e-Government websites and portal service, in four stage study analysis. The detail of behavior and instruments used in performing research operations is presented in this section.

Evaluation of Ethiopia E-Government Websites Usability from Management and User Perspective

When evaluating the e-Government websites, institution's information technology development and maintains division managements and service users were the key stakeholders to identify the issues of usability and accessibility. They are most important source of information to provide better and more usable website evaluation models and also the main actor of the e-Government services success and failure.

According to Lessa (2015) the evaluation of e-Government through the stakeholder perspectives can be considered as a proxy for the successful performance of an e-Government initiative or for the achievement of its objectives. Therefore, for this study also the management and end-users were addressed in order to gain an understanding of the root causes of the existing usability problems. Based on this, the following issues were examined:

- The participants' points of view on the existing state of e-Government website usability issues, as well as their understanding of the usability concept.
- The factors those affecting the successful e-Government website/portal deployment. These factors include training and practice, incentives, users' feedback mechanisms, challenges, available usability evaluation guidelines, models and resources.

3.3.1 Evaluation from managements' perspective

Wang (2009) and AlFawwaz (2011) pointed out that "the management was addressed in order to gain an understanding of the root causes of the existing usability problems". Since, in this study questionnaire techniques are used in order to collect information from sample selected organisations' IT management members, team leaders and senior e-Government project coordinators experts. For the qualitative study analysis, interviews also conducted with the selected organisations' ICT executives' management. Through this study the following key issues were examine:

- Understanding and explaining of the managements' usability and accessibility concept as well as their points of view on the existing state of e-Government website.
- The factors affecting the successful e-Government website deployment and to understand general organizational e-Government operations overview.

3.3.2 Evaluation from end-user's perspective

The user comments and suggestions on e-Government website usability and accessibility are identified through questionnaire. The identified issues are also further inputs for the proposal of the model. According to Bader (2011), before building model or proposing any solution for improving the usability of e-Government services, it is important to investigate the status of the existing websites from the end users point of view. In this study, the researcher has analysis user perspective data with category of websites' main functional characteristics and components; like End-user's perspective e-Government website information and page sequence characteristics', difficulty of reading characters; functionality, performance capability and reliability of websites service; websites appearance, navigation, content, overall capabilities and users' satisfactions.

3.3.3 Expert-Based Evaluation

Since, we were examining all the expert-based evaluation methods in Section 2.5.2., based on review presentations, heuristic evaluation was adopted for this thesis as the most suitable. In addition to the robustness of heuristic evaluations, two other factors accounted for selecting this evaluation. Firstly, heuristic evaluation is noted to be one of the most cost-effective expert-based usability evaluation method's that are easy, quick and very effective. Secondly, heuristic evaluation has been the most widely used and established expert-based method in the domain of e-Government usability. It is especially valuable when time and resources are short, because skilled evaluators, without needing the involvement of representative users, can produce high quality results in a limited amount of time (Nielsen, 2006, Verkijika & De Wet, 2016).

Accordingly, here the goals of the evaluation have been to identify the usability issues of Ethiopia e-Government websites, using expert-based Nielsen's ten heuristics evaluation principles. Therefore, the ten "golden rules" Nielsen's heuristics for user interface design and evaluation included (Nielsen, 2006)

1. Visibility of System Status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention

6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors and
10. Help and Documentation

➡ Procedures of expert-based evaluation

In terms of the evaluators and systems as cited in Abdulhadi, Steve & James (2009) note, considered that 3-5 evaluators. Based on this, the researcher has been selected five evaluators' experts. The experts are from information technology professional filed a minimum of four years or above work experience especially in web design and administration. The Ethiopian government portal (www.ethiopia.gov.et) was selected for the experts'-based assessment, because Ethiopian government portal is a one-stop shop multi-lingual national government portal for online services. That provides information and transactional services, which are created and maintained by various government organizations.

Expert based evaluation processes were done as adapted from research study of Jennifer et al. (2013). First, evaluators' expertise analysis results based on e-Government websites usability heuristics severity rating were analyzed. Then, severity ratings across all violations were summarized according to the number of expertise elected that severity scales. Finally, main identified issues on the violations of heuristic principles were presented. All experts' evaluation sessions follow the same procedure. They were also asked to record suggestions concerning each heuristic evaluation principles. After their independent evaluation, discussions were conduct with each evaluator to reach agreement on the usability problems that emerged from their evaluations.

3.3.4 Automated Accessibility Evaluation Tools

Web accessibility evaluation tools are software programs or online services that are used to check the website's accessibility level under web accessibility international guidelines (Yakup & Kemal, 2016). There are a number of guidelines and tools Web designers and webmasters can use to make their websites accessible to people with disabilities.

In this study to enhance the research finding reliability in the area of accessibility gaps and to identify the accessibility standards violated by Ethiopia e-Government websites and also to prevent a biased opinion from emerging in our research by using only human based (management, users and experts based) study analysis, we utilized World Wide Web (W3C) accessibility evaluation criteria. Those are accessed via online tools that verify the website compliance to the Web Content Accessibility Guidelines (WCAG) 1.0/2.0.

In this evaluation activities, the researchers act as evaluators of the above purposively selected five selected Ethiopia institutes e-Government websites/portals and including Ethiopian Government Portal getaway: Ethiopian Government Portal (www.ethiopia.gov.et), Ministry of Trade (www.mot.gov.et), Public Servants Social Security Agency (www.pssa.gov.et), Ministry of Foreign Affairs (www.mofa.gov.et), Ministry of Communication and Information Technology (www.mcit.gov.et) and Federal Transport Authority (www.fta.gov.et); using the following evaluations tools:

- **WAVE accessibility evaluation tool⁹:** is an online tool for the accessibility analysis of web sites based on the W3C WCAG 1.0 and WCAG 2.0 (Solomon & Ibrahim, 2016). Its goal is to analyze the level of accessibility in the design and development of web pages to allow access for all, regardless of their specific characteristics.
- **www.w3.org ¹⁰developer tools:** is an open source web analyzers tools gives online services that help determine if web content meets accessibility guidelines.

3.3.5 Research Population

Based on Ethiopian e-Government strategy documents and GTP-II implementations report, the population for this study was 34 Ethiopian government institutes' (Ministries, Agencies and Authorities'), ICT development management members, directorates', departments', bureaus' and agencies general directors, heads, general managers, senior IT professionals/coordinators and IT integrated service managers of the institutes. Which developed, maintain and manage e-Government web based transactional services and informational websites. Moreover, all services

⁹web accessibility evaluation tool: accessed from <http://wave.webaim.org/>:(accessed: Oct 10/2017)

¹⁰w3.org, (2018): Retrieved February 7, 2018, from <https://www.w3.org/developers/tools/>: W3C: World Wide Web Consortium Website

users, customers and visitors of the e-Government websites in Ethiopia, who may be able to provide information on usability and accessibility issues, were made up the target population for the study; as show in the Appendix: A - *Organizations and Number of Electronics Services*.

3.3.6 Sample Size

The study involved five government organisations' information technology development division directors, managers, team leaders and IT senior professionals'/coordinators, and all were responsible for the uptake of e-Government service development in the institutes.

The sampling technique for the selection of those information technology department managers of the organization was purposive or deliberate selection sampling, because the target populations of the study were arranged based on a factor that was influenced the measures and the analysis results. The purposive sampling selection criteria for the e-Government websites and portals were those institutes using their website/portal more for transactional and informational electronics services to typical types of public services. Therefore, the researcher selects those government organization's information technology development division directors or head based on their organizational number of transactional e-Government services and their services current functionality; as shown in Appendix A.

The table 3.1 below show the participant of the study and five government institutions' information technology development division managements were selected; based on number of web based transactional electronics services they used and their functionality. This means 14.71% from the total population of 34 organizations websites/portals based informational and transactional services providers. Therefore, those sampled institutes websites can be adequate for the illustrations of other organizations e-Government websites services problem identifications in the four stages analysis study.

Table 3.1 Participant of the study and selected institutes e-Government websites/portals

S N	Organization	Type	# of e- Services	Participant of the Study				
				Management Perspectives		users Perspectives	Expert Based Evaluation	Automatics Accessibility Evaluation
				for questionnaire	for interview	for questionnaire		
1.	Ministry of Trade (www.mot.gov.et)	Ministry	7	8	1	25	Five IT experts based on Jakob Nielsen's heuristic evaluation principles were selected. The evaluation was done on National gov't portal of www.ethiopia.gov.et	The researcher of this study was done the evaluation activities, based on W3C, WCAG 2.1 Using WAVE accessibility tools. The assessment was done on five gov't portals
2.	Public Servants Social Security Agency (www.pssa.gov.et)	Agency	6	8	1	25		
3.	Ministry of Foreign Affairs (www.mofa.gov.et)	Ministry	6	8	1	25		
4.	Ministry of Communication and Information Technology (www.mcit.gov.et)	Ministry	10	8	1	25		
5.	Federal Transport Authority (www.fta.gov.et)	Authority	18	8	1	25		
Total				40	5	125	5	1

The sample number of participants' management and head expert from the five selected government organizations were 40. Which have been seven IT management members and head IT professional expert from each organization, for questionnaire-based data collection instrument. The sample number was not large, because recruiting such staff is not an easy task due to they are considered a limited number as well as limited accessibility into officials' managers, head experts and time availability. However, this has been more reliable since, in addition to the questionnaire, interviews also conducted with those selected institutes' ICT executive managers and directors. For the qualitative study, IT management members and directors were selected and interviewed to gather their experiences and insights.

The second stage of this study was to build a clear overview about the issues of Ethiopia e-Government websites/portals usability from the perspective of service uses, because the role of the end-users or visitors was restricted in the other evaluation methods, as described in the literature reviews.

Nielson (2006) pointed out that "we can get good-enough data on four different designs by testing each of them with 20 users, rather than below your budget on only slightly better metrics for a single design. Therefore, it is usually recommended testing websites usability by 20

users when collecting quantitative usability metrics.” Therefore, in this study for the above five sample selected Ethiopia e-Government websites’/portals’ 125 participants (end-users or visitors) were takes on. Those are mainly based on the use of questionnaires including e-mail questionnaire, i.e. for each institutes’ 25 participants were chosen.

The selection method of each end-user, clients and visitors are using unrestricted convenience sampling, who may be able to provide information on the overall research context and easily accessible for the participation of the study. The relative cost and time required to carry out a convenience sample are small in comparison to probability sampling techniques and participants were readily available. Moreover, as with any other research, most of the time customers are uninterested or not volunteered to answer questionnaire due to numerous reasons. Therefore, convenience sampling is more productive for the method of end-user selection.

3.4. Data Collection Instrument

The instruments used for collecting the required data were questionnaire and interview. The data collection instruments are further described below:

3.4.1 Questionnaire Structure

According to Hsieh & Huang (2008) questionnaire is an easy, flexible, effective, and efficient ways to investigate the usability problems. On the basis of usability test and guidelines for usability evaluation questionnaire was adopted from Lewis (1995) “IBM usability satisfaction questionnaires” model and from literatures, Bander (2001) and Simin (2015), those were relevant to measure the identified research problems. The adopted questionnaires some parts were reviewed and minor modifications were done by the researchers to measure the content validity and design analysis based on Ethiopia government administrations systems and citizen culture. The verification of those modified questionnaires structure was done using pilot test, before the main data collection took place.

The primary goals of the adopted questionnaires were to discuss the characteristics of questionnaires that measure user satisfaction and usability issues with the user and management perspective and provide the questionnaires with administration and scoring instructions. Usability practitioners could use these questionnaires with confidence to help them measure users'

satisfaction with the usability of e-Government websites/portals. The questionnaire was self-administered by the participant answers the questions alone or the questionnaire administrates by authors asked participant question by questions. In addition to this, by mailing of questionnaires /on-line questionnaires/ using Google form, as shown below link address, using my Gmail account (yosroof@gmail.com) were designed and sent to the participant of the study:

- By mailing /on-line/ of questionnaires for management (*As shown in the Appendix: E*):

[<https://docs.google.com/forms/d/e/1FAIpQLSfvuxzOp5CzxEUaYHk9-jseJmgge474w2vbCb2wYbh02zX0Qw/viewform>]

- By mailing /on-line/ of questionnaires for user (*As shown in the Appendix: F*):

[https://docs.google.com/forms/u/0/d/1ECpquxEHwIrAKhEAAmHQvWh5tfT7_eC8N_S5sG44gGM/edit?usp=forms_home&ths=true]

The developed mailing (on-line) questionnaires link were mail to the perspective institutions managements', head IT experts' and users of the respondents with a request to return after completing. It is the most extensively used method in various economic and business survey to increase the probability of collecting more data and information (C.R.Kothari, 2004). The questionnaire items have been measured including a standard point Likert scale and also containing both open-ended and closed semi-structured questions as shown in Appendix: C for management perspective data collection and Appendix: D for user perspective data collection.

3.4.2 Interviews Questionnaire Structure

Sampling Technique and Procedure for the qualitative study of interviews were only those who serve as the head of IT departments were chosen using purposive sampling, because the participants were people who give inside and detail information about the study topic. The selected organizations were: Ministry of Trade, Ministry of Foreign Affairs, Ministry of Communication and Information Technology, Federal Transport Authority and Public Servants Social Security Agency.

Moreover, the methodology used was qualitative study by semi-interviewing five purposive sampling selected key informants for the study from the five selected organizations, to get their experiences in-depth opinion. The interview content was prepared with a list of main e-Government usability issues and questions drawn from the questionnaire of management and end-user perspectives. The process has been started by contacting the selected executive managers, briefly

describing the objective of the study and also sharing the support letter from school of Information Science, AAU as shown in Appendix: B. The interview appointment was set at the interviewees' convenient time, the outline was as shown in Appendix: G.

3.4.2.1 Pilot Test

A pilot study was conducted before the main data collection took place. This was done in order to reveal the weaknesses and to test the method of assigning weights and ratings. The instrument was pilot tested using sample of 15 purposively selected IT senior experts from MCIT, customers and postgraduate students using SPSS reliability scale tasting. Base on the reliability statistics analysis Cronbach's Alpha result for management and user perspective questionnaires were 0.784 and 0.878 respectively. As per Norman (2003), reliability statistics coefficient ranges between 0 and 1, with a high value indicating a high level of consistency among the items. Acceptable reliability range is 0.7 and above in general basic research. In this research all the measures were above 0.7. Hence, IBM SPSS Statistics Viewer test indicates that the survey questionnaire's reliable and internal consistent to use for the study.

3.4.3 Heuristics based evaluation

The evaluators of the portal were five experts from information technology professional filed a minimum of four years or above work experience especially in web design and administration (Abdulhadi, Steve, & James, 2009). The Ethiopian government portal (www.ethiopia.gov.et) was selected for the experts'-based assessment, because it is national government portal. The evaluation processes were done as adapted from research study of Jennifer et al. (2013). All expert based data collection sessions followed the same procedure, finally summary of each evaluator's main identified highlight issues on the violations of each heuristic principle were compiled and presented.

3.5 Data Analysis

The collected data was analysed using Statistical Package for the Social Sciences (SPSS) version 25 for Windows, after logged and tracked on Microsoft Excel Sheet. Data analyses included reliability, correlation analysis, and multiple regressions. Descriptive statistics were used to

describe the samples. The data was analysed using means, standard deviations, percentages, one-way ANOVA test and factor analysis.

Data cleaning or preprocessing was conducted for possible missing values and errors and duplicate data were identified. From the total number of 60 distributed questionnaires to the ICT managements, team leaders and senior IT head experts; 43 response questionnaires were collected. This indicates that the achievement of 107% out of 40 planed sampled data for management response rate. Moreover, from the total of 145 distributed questionnaires to users and visitors, 108 response questionnaires were collected. This indicates that the achievement of 86.4% out of 125 planed sampled data from end users' response rate for analysis of the study.

According to Besha (2013), all of the interview transcripts were read by the researcher and coded in to data analysis. Since, in this study the interview result was presented and reported simultaneously with quantitative data analysis study result, for the purpose of cross checking the questionnaires collected data analysis result with interviewees' response analysis result.

CHAPTER FOUR

Data Analysis, Discussion and Presentation

The purpose of this Chapter is to analysis, discuss and present e-Government websites usability and accessibility issues based on objectives of the study. The data obtained using mixed data collection and analysis, from various sources are presented with four sections. The first section discuss about the finding of management perspectives evaluation by incorporates quantitative data analysis and discussed with qualitative data analysis result. In the second section user-based evaluation of e-Government websites assessment with quantitative data are presented, analyzed and discussed with different user point of view. In addition, the interpretations of the data are presented using factor analysis and different analytical techniques. In the third section, expert based e-Government website usability evaluations are presented using top ten heuristics evaluation principles' in details. In the fourth and final section, automatics accessibility evaluation based on W3C WCAG 2.1 guidelines using online WAVE Accessibility Tool assessment results are analyzed, presented and discussed.

4.1 Management Evaluation of e-Government Websites

➤ Stage I: Management Perspective Evaluation Analysis Report

4.1.1 Demographics Description of the Respondents

In this section basic statistical description of respondents' demographics characteristics has been presented. Initially 60 questionnaires were distributed to MoT, MoFA, MCIT, PSSA and FTA ICT divisions' e-Government project development management, team leaders and senior IT professional experts or coordinators. Out of total distributed questionnaires, 43 valid questionnaires were collected. That indicates 107% successful achievement from planed sampled data (40) for management response rate.

As shown in Table (4.1), the study participants were majority (88.4%) of the participants were male, the other 11.6% were female. Majority (51%) of the participants were ages between 31 to 40 years that can be categorized as an adult range. Regarding IT management job positions of the participants were: 18.6% of the respondents were IT Manager / Director, 2.3% were IT Office head, 14.0% were Team leader, 58.1% were Senior IT Professional expert/Coordinator and 7.0% were different from those list, but their current job was related with e-Government project

management and coordination's areas. In the case of educational levels of the participants, majority of the respondents were hold bachelor degrees (76%) and the others 23% had postgraduate degrees.

Table 4.1 Demographics Description of the Respondents

		Frequency	Percent
Gender	Male	38	88.4
	Female	5	11.6
Age	22-30	16	37.2
	31-40	22	51.2
	51-65	4	9.3
Current job position	Manager / Director	8	18.6
	Office head	1	2.3
	IT Team leader	6	14.0
	Senior IT expert/ Coordinator	25	58.1
	Others	3	7.0
Educational level	Bachelor degree	33	76.7
	Postgraduate	10	23.3
Work experience in e-Government project development	Less than one year	5	11.6
	1-2 years	9	20.9
	2-4 years	9	20.9
	More than 4 years	19	44.2
	Total	43	100

As shown in Figure (4.1), Out of 43 valid collected data, most of (44.2%) the respondents were worked with the e-Government related project development for more than 4 years, 20.9% for 2-4 years, 20.9% for 1-2 years and 11.6% for less than one year.



Figure 4.1 Participant experiences with e-Government related project

4.1.2 Management View of e-Government Websites Usability Analysis Results

i. Management understanding on the importance of usability evaluation

Based on the statistical analysis of management understanding on the “importance of usability evaluation” for suitable e-Government website design and development analysis result indicates that; 95.4% of respondents think that usability evaluation is “Important”, 5.5% of respondents did “Not Sure” about the usability importance and No negative responses found from the participants. In general, the majority (95.4%) of the IT management members’ participants have Good understanding on the importance of e-Government websites usability evaluation.

As shown in the table 4.2, indicates cross tabulation statistics that, whether there was association between “management participants current level of job position” and “their understanding on importance of usability evaluation of the e-Government websites”. From the participant of all IT management members, the “Manager/director” and “Office head” positions officer have high understanding (100%) of the participants in usability evaluation, while team leaders have 83.3% of usability evaluation importance understanding.

Table 4.2: Cross tabulation statistical evaluation between “Usability Evaluation Importance” and current “Project Management Position” of the participant.

			Respondents' current job position					Total	
			Manager / Director	Office head	Team leader	Senior IT Professional Expert (Coordinator)	Other		
Usability evaluation important	Yes	Count	8	1	5	24	3	41	95.3%
		Percentage	100%	100%	83.3%	96%%	100%	100.0%	
	Not Sure	Count	0	0	1	1	0	2	4.7%
		Percentage	0.0%	0.0%	16.7%	4%	0.0%	100.0%	
	No	Count	-	-	-	-	-	0	
		Percentage	-	-	-	-	-	-	
Total		Count	8	1	6	25	3	43	
		Percentage	18.6%	2.3%	14.0%	58.1%	7.0%	100.0%	

ii. Usability evaluator or tester of e-Government website in the organizations

The analysis of e-Government service usability evaluators or testers of the organizations e-Government websites and portals, as show in the table 4.3 indicates that: 17% of the respondents for “IT experts”, 5% of the respondents for “Testers”, 4% of the respondents for “Developers” & the same as for “Project Managers”, 2% of the respondents for both “Developers” and “IT experts”

and 1% of the respondents for others. In general, most of the organizations e-Government websites usability and related system evaluation activities were done by their “IT experts”.

Table 4.3 Usability evaluator or tester of e-Government website and portal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Developers	4	9.3	12.1	12.1
	Testers	5	11.6	15.2	27.3
	Organization’s IT experts’	17	39.5	51.5	78.8
	Project Manager	4	9.3	12.1	90.9
	Developers and IT experts	2	4.7	6.1	97.0
	Others	1	2.3	3.0	100.0
	Total	33	76.7	100.0	
Total		43	100.0		

iii. Usability evaluation or testing technique of e-Government website

As discussed in the literature reviews of this study, there are three types of usability evaluations or testing methods. Those are user based, expert based and automatics evaluation methods. Based on this, the analysis of the participant of this study responses show that: the majority (51.2%) of the participants for usability evaluation or testing was for “User-Based Method”, 18.6% respondents for **both** “Users-Based, Expert-Based and Automatics Methods”, 7% of the respondents for “Expert-Based Methods” and 4.7% of the respondents for **both** “Users and Expert-Based Evaluation Methods”; as shown below in Figure 4.2. According to Umar and Khan (2008), appropriate usability inspection and testing methods needs to be employed during product development of websites. Moreover, after designing web evaluation practice needed to be applied and recommendations are issued to the concerned bodies to improve their service delivery via websites.

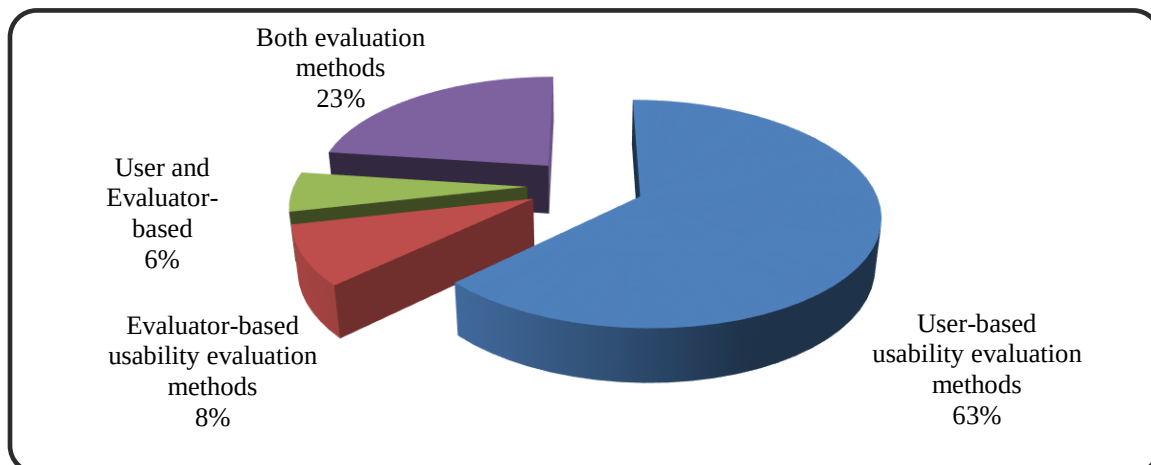


Figure 4.2 Usability Evaluation or Testing Methods Used by IT Managements

iv. Major constraints of using Usability Evaluation Methods

Regarding to the item responds of the major constraints with management views and practice in “*making usability evaluation methods as an integral part of website development projects*” were as shown in the table 4.4: majority (39.5%) of the participant of the study for “Lack of Usability Understanding”, 27.9% participant for “Lack of Usability Expert”, 18.6% participant for “Less Time”, 7.0% participant for “Less Budget”, 4.7% participant for “Too Much Conservative Management” and 2.3% participant of the study for other.

Table 4.4 Major constraints of using Usability Evaluation Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less time	8	18.6	18.6	18.6
	Less budget	3	7.0	7.0	25.6
	Lack of usability expert	12	27.9	27.9	53.5
	Lack of usability understanding	17	39.5	39.5	93.0
	Too much conservative management	2	4.7	4.7	97.7
	Other	1	2.3	2.3	100.0
	Total	43	100.0	100.0	

The overall quantitative analysis result of major constraints in using usability evaluation as an integral part of website development projects show that: organizational management usability evaluation understandings were poor, becomes the major problems. Then next to this, lack of usability experts also other main constraints.

When the interviewees conducted with the executive management about the major constraints of usability evaluation methods as an integral part of website development projects, they were answered that “*most of the time did not apply usability evaluation methods were an integral part of website design and development. Because of, most of the staffs, including the management did not attend usability and accessibility awareness creations and training programs, as a result most of the employees did not have enough usability understanding and evaluation skills of websites*”. Hence capacity building, training and awareness creation activities need to apply for improving those organizational awareness and skill problems.

v. E-Government website interfaces and layout design rating level

Management views and practice for the rating level (current status) of e-Government websites *interfaces* and *layout design* were analysis as shown in the table 4.5; above 50% of the participants were for positive responses, i.e. 51.2% participants were for “Average” and 40% participants were for “Good & Very Good”. Therefore, based on the management views the current e-Government websites interfaces and layout design were in Good conditions. Moreover, the qualitative study of executive management interviews results also shows almost more similar results. However, these analysis results were contradicted with users and expert based data analysis results of this study, as shown in the users and expert based analysis sections 4.2 and 4.3.

Table 4.5: Rating level of Ethiopia e-Government website interfaces and layout design

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very good	2	4.7	4.9	4.9
	Good	15	34.9	36.6	41.5
	Average	22	51.2	53.7	95.1
	Below Average	2	4.7	4.9	100.0
	Total	41	95.3	100.0	
Total		43	100.0		

vi. Organizational practices for encourage and promote the usage of e-Government websites

The data analysis result for the practices of organization in offering any incentives to increase and encourage the IT Managements’ and employees for the usage and upgrading of their e-Government websites, as shown in the table 4.6 below: majority (88.4%) of the participants for “No” of any encouragement and incentives, while for “Yes” for 11.6% of practices of encouragement. Therefore, it shows that most of the government organizations lack of organized mechanisms of increase the usage of their websites.

In addition, with the qualitative study, when the IT Executives management members interviewed about offering any incentives to increase and encourage the usage of their e-Government services, they were also confirmed that “*the organizational administration approach of employees’ encouragements were not efficient or not interesting to work more*”.

Table 4.6: Organizational practices for encourage the usage of the e-Government websites

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	5	11.6	11.6	11.6
	No	38	88.4	88.4	100.0
	Total	43	100.0	100.0	

vii. Complaint raised on e-Government websites services

As shown in the table 4.7, when participants of this study were asked regarding “complaint raised” from users and visitors of e-Government websites in the areas of difficulties faced were: 41.9% respondents for “Yes Rarely”; 37.2% respondents for “No”, 16.3% respondents for “Yes Regularly”, as show in the table 4.7. Therefore, it shows that there are some complaints about the organizational websites from the users or customers, so it requires to makes improvements in the areas of usability and accessibility gaps based on the users’ requirements.

Table 4.7: Complaint received in the difficulties faced by the users of e-Government websites

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, Regularly	7	16.3	17.1	17.1
	Yes, Rarely	18	41.9	43.9	61.0
	No	16	37.2	39.0	100.0
	Total	41	95.3	100.0	
Total		43	100.0		

viii. Success or failure of e-Government projects in relation with Usability

In this research analysis, Management were asked to their understanding and experience in concerning the success or failure of e-Government projects in relation with usability issues, as show in table 4.8; majority (58.1%) of participants for usability is “Very Import”, 32.6% participants for usability is “Important” and 7.0% participants for “I don’t know”. According to Barnes and Vidgen (2004), usability affects the success or failure of e-Governments services. This study analysis survey results also shows: 90% of IT management and Coordinators participants approved the “importance of the system usability for the success of e-Government services”. Indeed, the success of e-Government services depends on its quality and usage (Lessa, 2015).

Moreover, when the executives' IT Management interviewed concerning the success or failure of e-Government projects including web services, consideration with services usability; most of management members expressed usability problems have “big influence for the success or failure of the services”. Therefore, usability has been known to play a central role in the success of any e-Government initiative (Verkijika S. F., 2017).

Table 4.8: The success or failure of e-Government projects in relation with usability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very important	25	58.1	59.5	59.5
	Important	14	32.6	33.3	92.9
	I don't know much about it	3	7.0	7.1	100.0
	Total	42	97.7	100.0	
Total		43	100.0		

ix. Management practices and level of reactions for the e-Government website

In order to identify e-Government project management practices and level of reaction to the e-Government website, the research investigation of participants' views and responses were discussed below, as shown in the Table 4.9:

- The participant views regarding “***e-mail and FAQs***” websites services were: ***sufficient for the users' feedback***: 37.2% of the participants were for “Agree” and 4.7% of the participants were for “Strongly Agree” and 41.9% of the participants were for “Disagreement” category.
- Concerning the e-Government websites “***language understandable and appropriateness***”, 67.4% of the participants were for “Agree”, 11.6% of the participants were for “Strongly Agree” and 9.3% of the participants were for “Disagreement” category.
- Regarding “***use of the e-Government website for information needs and transaction activities***”, 55.5% of the participants were for “Agreement” category and 18.6% of the participants were for “Disagreement” category.
- Management responses with “***the content of the website***”, 27.9% of the participants were for “Agreement” category and 64.8% of the participants were for “Disagreement” category.
- About “***icons and links provide meaningful information***”, 48.8% of the participants of the management were for “Agreement” category and 25.6% of the participants of management were for “Disagreement” category.

In General, based on the above analysis results majority of the participant responses for the e-Government service practices and level of reactions were for “Agreement” category. But, for the status of “**websites’ and portals’ contents**”: the web contents were not satisfying the IT management of the study, i.e. 64.8% of the participants were for “Disagreement” category. Also, the “**icons and links**” of the website were not meaning full and inappropriate, as a result, they may not be easy to understand to users of websites, who may be users from public/citizens and from weaker socioeconomic or educational background (Rajshree & Ganesh, 2015).

In the qualitative interview analysis results also shows that; the current status of e-Government websites was lack of (insufficient) updated news, activities, updated events, announcements information and broadcast, tender, recruitment announcements, newspaper clippings, statements or articles and poster / banner.

Table 4.9: Management view to the e-Government website service capability

No	Views of management for the following e-Gov. website facility/capability	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	The e-Government website or portal structure mechanism such as e-mail, FAQs... is sufficient to address the problems faced by the users.	-	41.9 %	14.0 %	37.2 %	4.7 %	3.05 %	1.01
2.	The language of the Ethiopia e-Government website is understandable and appropriate	-	9.3 %	11.6 %	67.4 %	11.6 %	3.8 %	0.76
3.	I use the e-Government website regularly for most of my information needs and transaction activities.	2.3 %	16.3 %	25.6 %	48.8 %	7.0 %	3.42 %	0.93
4.	The content of the website met my expectations	34.6 %	30.2 %	27.9%	27.9%	-	2.07%	0.96
5.	Icons and links on the e-government website provide meaningful information.	9.3 %	16.3 %	25.6 %	39.5 %	9.3 %	3.23 %	1.13

x. Challenges of making e-Government website usable

When the participants were asked about the major challenge of making e-Government websites usable, they responded for “**Agree and Strongly Agree**” as follows: 90.7% respondents for the challenges of “Lack of usability awareness” (*absence of guidelines and standards*), 83.8% respondents for “Lack of end user involvement in the initial stage of design”, 79.1% respondents for “Lack of feedback from end-users” (customers), 76.7% respondents for “Management problems” and, finally 44.2% respondents for the challenges of “Lack of budget”.

In most cases, the participants of the study were agreed with the given list of the e-Government service challenges. Above all, the participants of the study major challenges were indicated for “***lack of usability awareness, guidelines and standards***”, as shown in the table 4.10. According to Abdulhadi et al. (2009), more specific guidelines for e-Government websites are necessary to fulfill the websites’ intended purpose.

As shown in the table 4.10 from participant of the study, 83.8% “agreement” category for “***Lack of end user involvement in the initial stage of design***”. This is one of the main problems of e-Government websites prepared requirements and guidelines face were not understanding or ignoring the users’ needs, which will negatively affect the usability of websites further inhibit e-Government implementation. These issues are more significant in developing countries (Elsheikh, Cullen, & Hobbs, 2008).

Table 4.10: Usability Challenge of e-Government Website

No	Challenges of e-Government website and Management experience and opinion	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	Lack of budget	11.6	23.3	18.6	34.9	9.3	3.07	1.22
2.	Lack of awareness of usability (absence of guidelines/ standards)	2.3		7.0	58.1	32.6	4.19	0.76
3.	Lack of feedback from end-users		9.3	11.6	46.5	32.6	4.02	0.91
4.	Lack of end user involvement in the initial stage of design		7.0	9.3	51.2	32.6	4.09	0.83
5.	Management problems	4.7		18.6	37.2	39.5	4.07	1.01

xi. Improve and increase the usability of e-Government websites

Regarding management views for “***improve and increase the usability of e-Government websites services***”, all most all of the participant positives responses, either “Agree” or “Strongly Agree”. As shown in the table 4.11 below: the “***Agreement***” category responses were: 83.8% respondents for “Trained staff”, 65.1% respondents for “More budgets”, 88.4% respondents for “Involving end-users” and the same as for “Applying planed usability evaluation” and, finally 86.1% respondents for “Clear guidelines and standards”. The highest values of respondents’ percentages were for “***Involvement of end-users***” and “***applying usability evaluation***”.

Therefore, involvements of representative users are useful for producing high quality system result with limited amount of time and resources (Nielsen, 2006, Verkijika & De Wet, 2016). Also, usability evaluations are important for evaluating the application functionality, to verify the effect of its interface on user and to identify any specific problem with the application (Joel et al., 2015), as with this study analysis also usability evaluation have more respondents' rates.

Table 4.11: Usability Challenge of e-Government Website (Percentage distribution, Mean and Std. Dev.)

No	Opinions on the importance of the following conditions to improve e-Gov. Websites Usability Challenge	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	Trained staff		9.3	7.0	32.6	51.2	4.26	0.95
2.	More budget	4.7	14.0	16.3	55.8	9.3	3.51	1.00
3.	Involving end-users		4.7	7.0	41.9	46.5	4.30	0.80
4.	Clear guidelines and standards		9.3	4.7	23.3	62.8	4.4	0.95
5.	Applying planned usability evaluation		4.7	7.0	34.9	53.5	4.37	0.82

xii. IT Management administration practices for website usability

Based the study assessment results, the current organizational IT Management administration practices for e-Government websites usability issues were more in the “Disagree” and “Strongly Disagree” category. As shown in the table 4.12 below, respondents for “**Strongly disagree**” and “**Disagree**” were: 53.5% respondents for “Gives attentions to the end users requirements”, 44.2% respondents for “Survey done after launching for further improvement” and 46.6% respondents for “Training for the staff”. The aggregated mean of positive respondents for those three main e-Government websites administration practices were less than 30%, as shown in the Table 4.12 below.

Table 4.12: IT Management administration practices for website usability

No	Management administration practices for website usability	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	Pay attention to the end user requirements.	39.5	14.0	20.9	23.3	2.3	2.35	1.29
2.	Survey the requirements of end user after launching the website for further improvement.	18.6	25.6	23.3	20.9	11.6	2.81	1.3
3.	Training on websites usability for staff.	32.6	14.0	23.3	11.6	18.6	2.70	1.50
	Aggregated Percentage / Mean	30.23%	17.87%	22.5%	18.6%	10.83%	2.62%	1.36

In general, the current government organizations management practices in the main implementation activities for build more usable e-Government websites services were “*not give enough attentions to the end user requirements*”, as shown in figure 4.3.

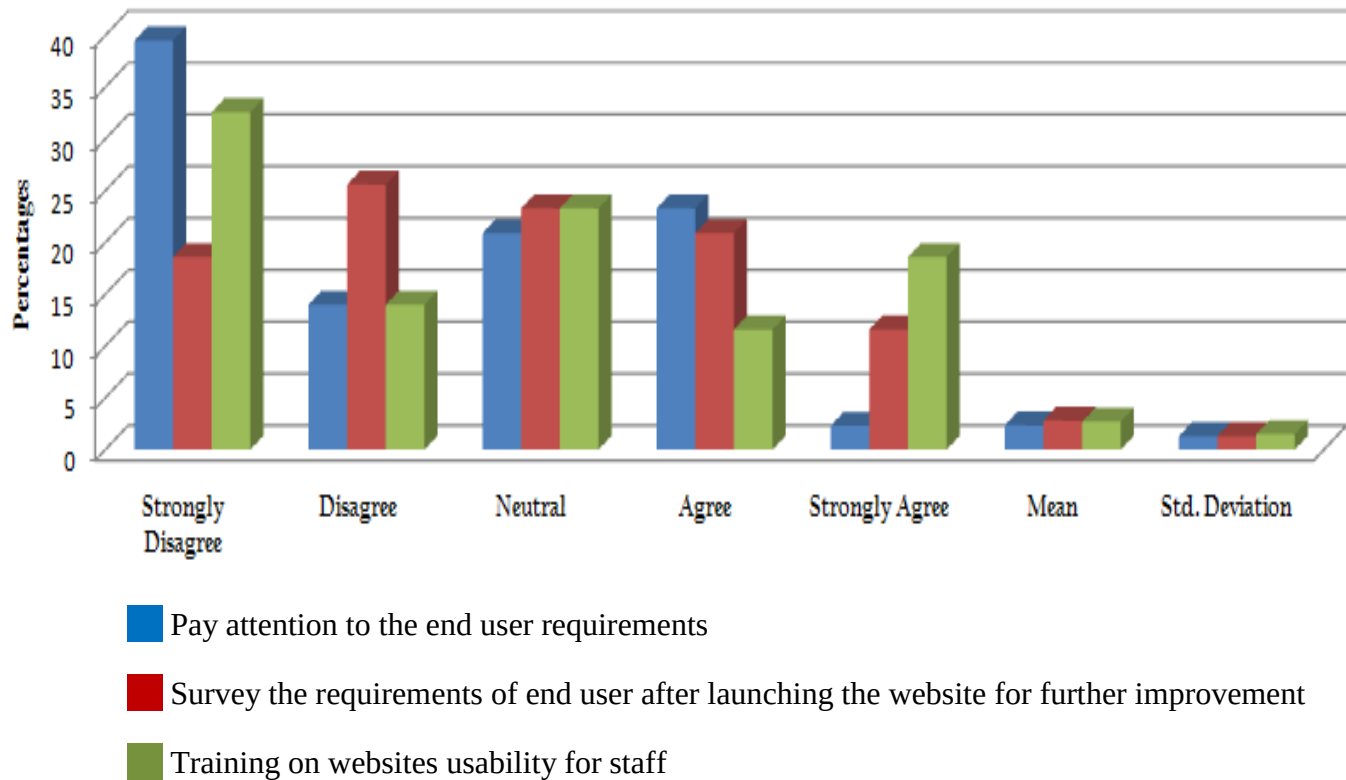


Figure 4.3: IT Management’s administration practices for website usability

4.2 User Perspective Evaluation of e-Government Websites

➡ Stage II: User Perspective Evaluation Analysis Report

The end-user point of view assessment was considered as one of the main important factors for the e-Government websites usability. Therefore, in investigating the status of usability of the existing e-Government websites in Ethiopia, this section focused on the end-user perspective evaluation:

4.2.1 Demographics Description and Pre-Test Analysis of the Respondents

The data pertaining to the distribution of the respondents by gender and age for demographics analysis, and computer basic skill, expertise with internets and use of e-Government websites characteristics for pre-test questionnaires analysis. As shown in table 4.13 from the total participant of the study 51.9% users' participants were male and the others 48.1% were female; and aged between 31 to 40 years were the majority (44.4%) of this study participant.

Table 4.13 Demographics Description

		Frequency	Percent
Gender	Male	56	51.9
	Female	52	48.1
Age	22-30	29	26.9
	31-40	48	44.4
	41-50	28	25.9
	51-65	1	0.9

The pre-test questionnaires analysis results show in the figure 4.4, from the total participant of the study above 90% respondents have “basic computer skill” and “experience with the internet’s” and also around 65% of the respondents have “sometimes or always use Ethiopia e-Government websites”.

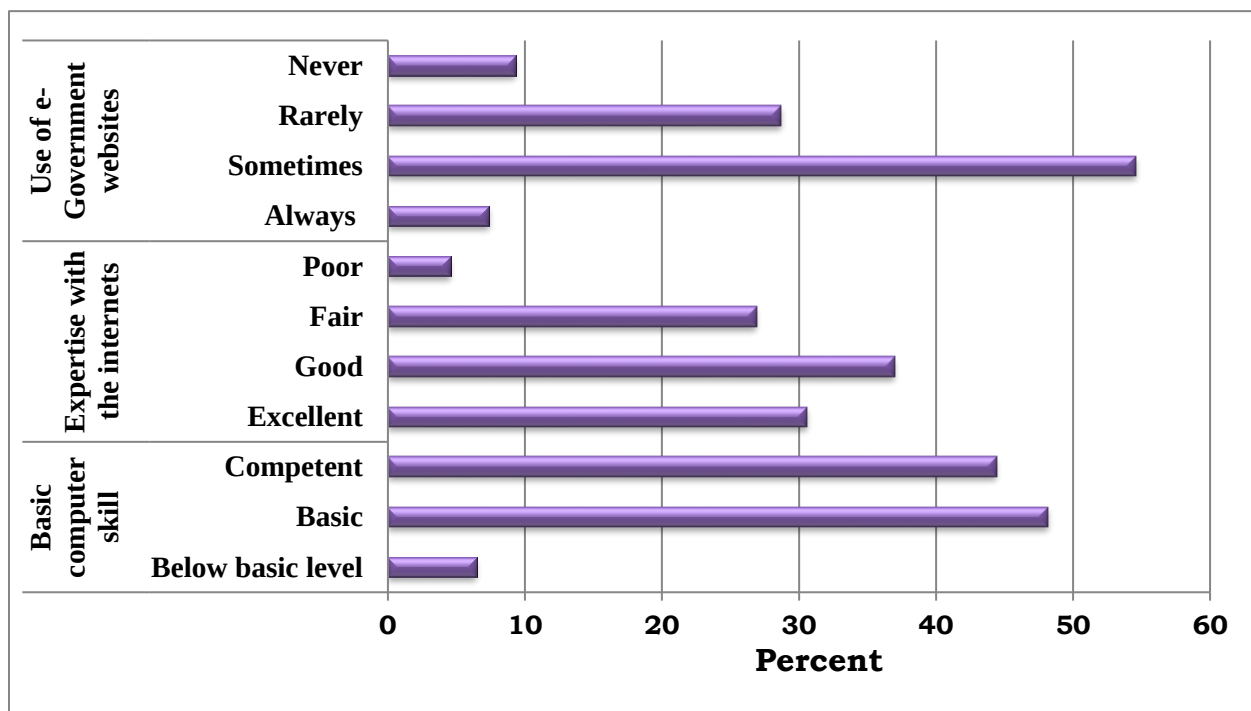


Figure 4.4 Pre-Test Questionnaire Analyses

4.2.2 Users Perspective Assessment Analysis Result

In the following section, end-user perspective evaluations of Ethiopia e-Government websites analysis results were presented in the following categories: website information and characteristics of page sequence, difficulty of reading characters, functionality, performance capability and reliability of the websites.

i. Analysis of Website Information and Page Sequence Characteristics'

As shown in table 4.14, the usability assessment questionnaires for Ethiopia e-Government website from users' perspectives indicates that, 49.1% of the respondents were "confusing with the e-Government website information" and 50.9% were "clear and very clear with the web information". This shows that almost half of the participants of the study were "Agree" and the other "Not Agree" about the website information organizations. In the case of website page sequences 67.6% of the respondents were "Confusing with page sequences"; the other 31.5% of the respondents were "Agree with the clear and very clear page sequences". Therefore, based on the respondent rating result, the e-Government websites information and page organizations and design were need to more updated, upgraded and structured.

Table 4.14: E-Government website information and page sequence

No.	Characteristics'	Confusing		Clear		Very Clear		Mean	Std. Deviation
		Frequency	Percent	Frequency	Percent	Frequency	Percent		
1.	Website Information	53	49.1%	51	47.2%	4	3.7%	1.55	0.57
2.	Website Page Sequence	73	67.6%	32	29.6%	2	1.9%	1.34	0.51

ii. Analysis of Difficulty of Reading Characters on E-Government Website Pages

Respondents were asked to evaluate reading characters on e-Government website page. As can be seen in table 4.15, the percentage distribution of respondents for the survey question of the website characters shows above 85% respondents were for "Moderates & Simple" and only 13% of respondents indicated that the websites reading characters were "Hard for Users", as shown in the table 4.15.

Table 4.15: Reading Characters on e-Government website page

No.	Characteristics'	Hard		Moderate		Simple		Mean	Std. Devi.
		Frequency	Percent	Frequency	Percent	Frequency	Percent		
1.	Reading Characters on e-Government website page	14	13%	76	70.4%	17	15.7%	2.03	0.54

iii. E-Government Websites Functionality, Performance Capability and Reliability of Service

Websites pages might include many functionality features based on its purpose, such as *online registrations, help, feedback and support, search, email, calculator, login functionality and other many features*. When the participant of this survey study asked about e-Government websites functionality and capability performance as shown in the table 4.16; 61.1% of the respondents were for “Poor”, 38.0% were for “Good” and 0.9% was for “Excellent”. This indicates that the Ethiopia e-Government websites have “*lack of many functionality performances and features*” based on the users’ responses of the questionnaires and needs.

In the case of reliability features the respondents’ gives above 60% were for ‘Good’ and 38.0% were for ‘Poor’. This indicates that the e-Government websites services level of reliability (trustworthy) for the users were in Good condition. *Like the following reliability features*: did not uses more pages, not ask more about the users’ personal information without a legitimate reason, may be pages links also not more suspicious for malwave, and websites that may not “phish” for passwords to Facebook, Gmail, or other popular online services features.

Table 4.16: E-Government Websites Functionality, Performance Capability and Reliability of Service

No.	Characteristics'	Poor		Good		Excellent		Mean	Std. Devi.
		Frequency	Percent	Frequency	Percent	Frequency	Percent		
1.	Functionality and capability performance	66	61.1%	41	38.0%	1	0.9%	1.4	0.51
2.	Reliability level (trustworthy)	41	38.0%	52	48.1%	14	13.0%	1.7	0.67

4.2.3 Users' reaction to the e-Government website main usability issues

The main website usability issues with end-user feedback to e-Government websites were assessed with the following five categories: websites appearance, navigation, content, overall capabilities and users' satisfactions. The assessment analysis results were presented as follows:

i. Websites Appearance

According to Michale and Ben (2005), the websites appearance characteristic issues can help a website communicates effectively with users. In this website appearance analysis result, as shown on table 4.17, the **"quality of website appearance"** examined through the following variables: visually attractiveness, consistency, meaningful icons and links, highlights the most important content, strictly decorative and readable font size characteristics.

The aggregated mean (mean of the mean) result for the e-Government websites appearance attribute construct was 2.35 or 58.05%, which was from end-user viewpoint of e-Government websites' taken as a whole *Appearance rated in the "disagreement" category*.

Among the appearance attributes related variables addressed in the questionnaire, *"too much inconsistency of the website"* has the lowest mean value (1.95) and *"disagreed"* by most of the respondents (80%), compare to others attributes of the appearance variables. Therefore, it is important to ensure visual consistency; steps should be taken to emphasize important text. Also commonly used headings should be formatted consistently, and attention-attracting features, such as animation, only be used when appropriate. With this appearance characteristic analysis result the e-Government websites' need to ensure that the format of common items is consistent from one page to another. All e-Government websites pages should provide the consistent user interfaces that present the same options in the same way over the whole website and ensure visual consistency of website elements within and between web pages.

The respondents mean value for the variable *"font is readable size"* was 3.06, since the respondents were more agreed with the e-Government websites appearance of font size. But, to fill the other gap of font readability, need to use a familiar font to achieve the best possible reading speed.

Table 4.17: Appearance analysis of e-Government websites/portals (Grand Mean and Std. Deviation)

No	Appearance of e-Government websites/portals	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	This website is visually appealing (attractive)	16.7	41.7	34.3	6.5	0.9	2.33	0.86
2.	I thought there was too much inconsistency in this website	30.6	49.1	13.9	4.6	0.9	1.95	0.85
3.	Icons and links on the e-Government website provide meaningful information	20.4	40.7	27.8	7.4	2.8	2.31	0.97
4.	The e-government websites highlight the most important content at the main page.	8.3	48.1	29.6	11.1	97.2	2.45	0.81
5.	Visuals serve purpose and are not strictly decorative	30.6	38.0	25.0	3.7	97.2	2.02	0.85
6.	Font is readable size	7.4	16.7	41.7	29.6	3.7	3.06	0.96
Aggregated Percentage / Mean, Std. Dev		19.0%	39.05%	28.72%	10.48%	33.78%	2.35	0.88

ii. Navigation

Many features come together to create a quality website. One of the main integral components is the website navigation. It includes: homepage length, size and resolution; hyperlinks, convenient approach to direct users to the right information and services or personalization and site map that contains interactive table of contents (NDE & MSC, 2014).

In order to assess e-Government website usability navigation issues, respondents were asked for their view with respect to navigation scheme and features as shown in the table 4.18. The overall mean value (2.33) indicates large number of disagreed rating scale. That was 71% of the respondents for “disagreement” category. When we compare the navigation rating scale with appearance scheme, it was lower respondents for the navigation feature.

From the total participant of this study analysis, 56.5% respondents for the survey of navigation menu is ‘simple and straightforward’ were for “disagree” category; 55.5% respondents for survey of ‘the links are easy to find’ were categorized for “disagree” and 59.3% respondents for survey of ‘a clear back link on each page’ which leads to the homepage were also for “disagree” category. In general, the respondents for ‘Navigation’ of e-Government websites majority were categorized for “disagreement” category. These mean, the e-Government website navigation was

difficult to moving around from page to page within a website and could not provide people with the easy ways to navigate through to access the web content. If the navigation has not been designed well it can also easily hinder the users and they will not use the website again.

Table 4.18: Navigation analysis of e-Government websites/portals (Grand Mean and Std. Deviation)

No	Navigation of e-Government websites/portals	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	Navigation menu is simple and straightforward	7.4	49.1	35.2	6.5	0.9	2.44	0.77
2.	The links are easy to find (e.g. underlined text to indicate links)	15.7	39.8	25.9	14.8	3.7	2.51	1.05
3.	There is a clear back link on each page which leads to the homepage	21.3	38.0	29.3	9.3	-	2.27	0.91
4.	No dead links	26.9	44.4	21.3	6.5	0.9	2.10	0.91
	Aggregated Percentage / Mean, Std. Dev	17.83%	42.83%	27.93%	9.28%	1.38%	2.33	0.91

According to Anwar and Adam (2012), the web is navigational environment and travelers (web site visitors) walk around in this virtual world by activating hyperlinks. To fulfill the information needs of the web users and the success of the website, the e-Government websites must have a systematic, planned and logical navigation system that meets the expectations of the real-world navigation.

Thus, Ethiopia e-Government websites navigation page need to more effective and efficient to help users to locate and link to destination pages and should allow users to find and access information effectively and efficiently.

iii. Content

Content is the most important part of a website. If the content does not provide the information needed by users, the website will provide little value no matter how easy it is to use the site. Thus, Ethiopia e-Government websites content attributes survey result as shown below in the table 4.19 and figure 4.5; its analysis result was one of the low rated from all e-Government website theme constructs. The aggregate mean (mean of the mean) result for the websites content construct was 1.98, which is rated in the “Disagree” category, i.e. 74.3% was in the “disagreement” category, only 5.8% respondents were for “agree” category. This user’s respondent result was more similar

to the management perspective evaluation analysis results, i.e. the participants of management respondents 64% for content of the website were for ‘disagreement’ category.

According to Michael and Ben, (2005), content is the most critical element and more important than navigation, visual design, functionality, and interactivity of any websites’ feature. Therefore, the analysis result of this study indicates that, the Ethiopia e-Government websites contents were needs to improve.

Table 4.19: Content analysis of e-Government websites/portals (Grand Mean and Std. Deviation)

No	Content of websites/portals	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	The content of the website met my expectations	34.3	45.4	15.7	2.8	0.9	1.89	0.83
2.	It is easy to find the information / service which is related to the task	32.4	50.9	14.8	1.9	-	1.86	0.73
3.	The websites have up to date information	44.4	21.3	24.1	8.3	1.9	2.02	1.09
4.	No “under construction” pages	21.3	47.2	21.3	6.5	0.9	2.16	0.88
Aggregated Percentage / Mean, Std. Dev		33.1%	41.2%	18.98%	4.88%	0.93%	1.98	0.88

According to Nielson (2000), there are a number of main reasons behind users revisiting some websites and not others. The majorities of elements demanded by users in most cases are called “HOME” elements and include: **H**igh quality content, **O**ften update, **M**inimum download time and **E**ase of use

In addition, the contents should be placed with a well-structured layout. In short, the acceptability of websites by users relies on web usability (Simin, 2015). Thus, currently the content of Ethiopia e-Government websites/portals services was not satisfying users’ information and resources need. Moreover, if the Ethiopian Government institutes’ wants users’ participations and performance with e-Government services, it is important; make decisions about content, format, interaction, and navigation before deciding on development, colors and decorative graphics.

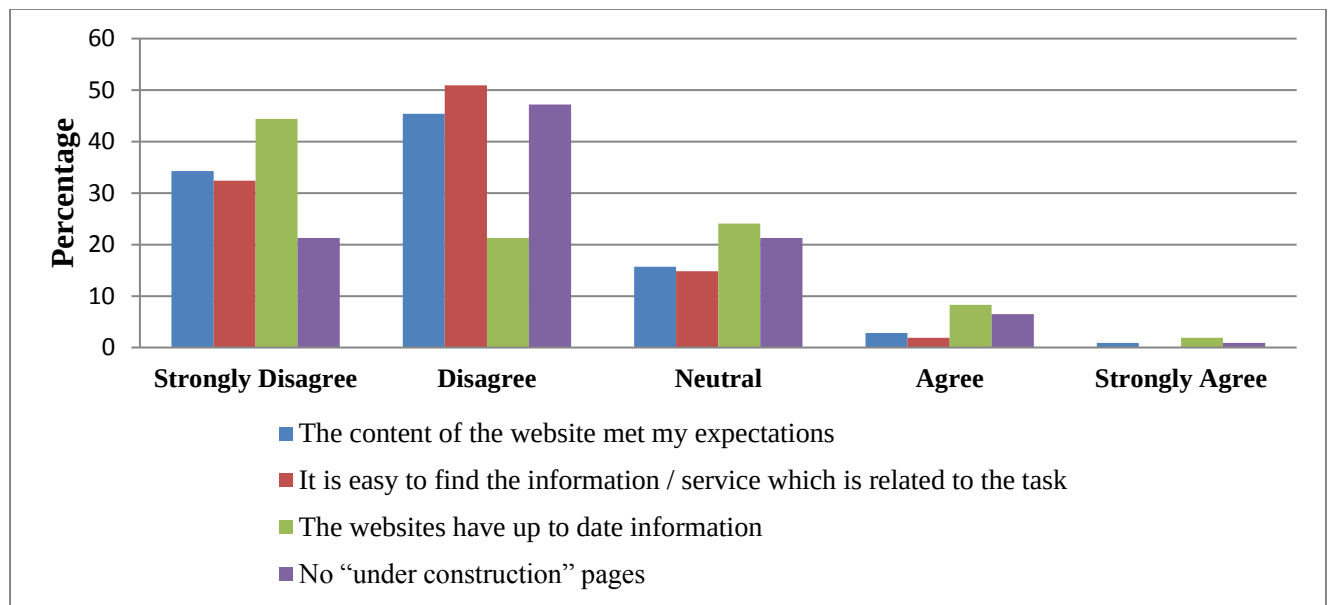


Figure 4.5 Users perspectives Content analysis of e-Government websites

iv. Overall Capability of e-Government Websites

The websites system's overall technical capability characteristics significantly impacts the end user's satisfaction and, by the same token, the effective utilization of the systems and its implementation success (Moore & Benbasat, 1991).

Respondents were asked to evaluate the overall capabilities of e-Government websites', as can be seen in table 4.20. The aggregate mean (mean of the mean) result for the overall capabilities of websites attribute construct was found to be 2.45, which was rated in the 'disagreement' category. Among capabilities attribute related variables addressed in the questionnaire, the e-Government website has '*integrated mistake correcting systems*' have the lowest mean value (2.18) and for the variable '*I think I would need technical support to be able to use this website*' have the highest value (3.05). As a whole, from the participant of the survey study above 50% respondents were for "disagreement" category. In particular, the e-Government websites need to include effective integrated mistake correcting systems.

Table 4.20: Overall capabilities survey analysis of e-Government websites

N _o	Overall capabilities of websites/portals	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	The overall organization of the site is very understandable and easy to use	26.9	33.3	28.7	8.3	0.9	2.22	0.98
3.	Websites have integrated mistake correcting systems	25.9	38.0	26.9	8.3	-	2.18	0.92
3.	Websites are designed for all levels of users	27.8	25.0	27.8	17.6	1.9	2.41	1.13
4.	The language of the website was understandable and appropriate	24.1	25.9	36.1	9.3	1.9	2.37	1.02
5.	I think I would need technical support to be able to use this website	6.5	27.8	24.1	38.0	3.7	3.05	1.04
	Aggregated Percentage / Mean, Std. Dev	22.24%	30%	28.72%	16.3%	1.68%	2.45	1.02

v. Users Satisfaction

According to Marzie and Mohamed (2008), many website designers have little knowledge of user interface design and usability engineering, therefore, wasting users' time and causing unnecessary traffic on the internet. Based on this assessment analysis result shows, '*user satisfactions level*' on Ethiopia e-Government websites services was in the "disagreement" category or not accepted by most of the respondents (55%), as shown in the table 4.21.

According to Abdulhadi et al. (2009), improving the usability of the e-Government website will increase the website users' satisfaction. Having users with higher satisfaction will reduce the cost of having field interaction with the citizens. This implies that not only having appropriate contents and services available into the application, but also making them easily reachable by users through appropriate hypertexts and allows users to easily retrieve and browse contents and invoke available services and operations.

As can be seen in table 4.21, the aggregated mean of the respondents for the survey question of 'feel very confident using the website' was 2.06, for 'I will likely use this website in the future' was 2.83, for 'memorable URL' was 3.45, for 'the e-Government portal provides me the necessary help' was 1.96 and finally for 'websites save my time for completing the task' was 2.05. From the total participant of the study result 'memorable URL' has the highest respondents mean value (3.45) and 'provides the necessary help' has the lowest mean value (1.96).

Therefore, overall users' opinions and feedback shows on the "overall satisfaction levels of e-Government websites" were in the negative expirations of opinions, i.e. majority (53%) of the respondents were included in to "disagree" or "strongly disagree" category.

However, In the case of "Reliability Features (trustworthy)", as shown in the Table 4.16 above, the respondents' gives above 60% were for 'Good' and 38.0% were for 'Poor'. This indicates the users have good reliability features on the e-Government websites services. But for the current survey question for 'Feel very confident using the website' was 2.06 as show in table 4.21. Therefore, the participant of the study on this issue did not have similar responses or understandings.

Table 4.21: Satisfactions of user survey analysis of e-Government websites/portals (Mean & Std. Dev)

No	Satisfactions of user	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Deviation
1.	I feel very confident using the website	33.3	34.3	25.9	5.6	0.9	2.06	0.95
2.	I will likely use this website in the future	13.9	20.4	36.1	25.9	2.8	2.83	1.06
3.	Memorable URL for home page	11.1	9.3	19.4	40.7	17.6	3.45	1.22
4.	The e-government portal provides me the necessary help that is required	31.5	42.6	21.3	1.9	0.9	1.96	0.84
5.	The e-government websites save my time for completing the task.	33.3	34.3	26.9	5.6	-	2.05	0.91
	Aggregated Percentage / Mean, Std. Dev	24.62%	28.18%	25.92%	15.94%	4.44%	2.47	1.00

4.2.4 One Way ANOVA Test

One Way ANOVA Test is needed to identify the differences in the government websites service usability in terms of users' perspectives with '*the overall organization of the website is easy to understand and use*'. As shown in table 4.22, after analysis using one-way ANOVA test that significance values (sig.) for 'overall organization of the website is easy to understand and use' is "more than 0.05" (0.129). Thus, we can conclude that there is 'no statistical differences' of the participant of the study analysis result in terms of '*the overall organization of the website is easy to understand and use*' in the existing Ethiopian e-Government websites.

Table 4.22 **One-way ANOVA Test – 1**

ANOVA					
The overall organization of the website is easy to understand and use					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.761	4	1.690	1.831	.129
Within Groups	93.249	101	.923		
Total	100.009	105			

To identify statistical differences in the existing e-Government websites services with the respondents of ‘*Technical support need to be able to use the e-Government website*’, after using one-way ANOVA Test, as shown in table 4.23 that significance values (Sig.) is “less than 0.05” (0.028). Therefore, we can conclude that there is ‘statistical differences’ in terms of the respondents within ‘*Technical support to be able to use the website*’ in the existing e-Government websites’.

Table 4.23 **One-way ANOVA Test – 2**

ANOVA					
I think I would need technical support to be able to use this website					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.936	4	3.234	2.906	.028
Within Groups	79.011	71	1.113		
Total	91.947	75			

4.2.5 Usability Factor Analysis of e-Government Websites Users- Principal Component Analysis

Factor Analysis is used to determine to traits or factors that comprise a set of data. The Principal Component Analysis (PCA) technique is very helpful to reduce the size of independent variables (dimensions) especially when the number of variables considered is very large. In this study PCA was used to identify representative variables in the subsequent analysis and evaluate the usability main factors of e-Government websites end-users.

The KMO (Kaiser-Meyer-Olkin) test is a measure of whether the distribution of values based on the sample is adequate for conducting a factor analysis. This test indicates the amount of overlap or shared variance between pairs of variables. Kaiser (1974) recommends the KMO statistic a bare minimum of 0.5 and the values between 0.5 and 0.7 are considered average; values between 0.7 and 0.8 are considered good; values between 0.8 and 0.9 are considered great; and values above 0.9 are considered superb (Hutcheson & Sofroniou, 1999). As indicated in the table 4.24, for the

data under consideration the KMO value was 0.785, which falls into the range of being good, so the study has confidence that the sample size was adequate to factor analysis and transforms the original variables into smaller set of linear combinations and bring out strong factorial patterns in a dataset i.e. statistical Principal component analysis (PCA).

Table 4.24 KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.785
Bartlett's Test of Sphericity	Approx. Chi-Square	788.876
	df	231
	Sig.	.000

4.2.5.1 Factor Extraction Output

The factor extraction output lists as shown in the Table 4.25 lists the eigenvalues (variances of the factors) associated with each linear component (factor) before extraction, after extraction and after rotation. Before extraction, SPSS has identified linear components within the data set. The output that show the eigenvalues associated with each factor represents the variance explained by the particular linear component and also displays the eigenvalue in terms of the percentage of variance explained. In factor analysis, eigenvalues are used to condense the variance in a correlation matrix. According to Tabachink and Fidell (1996), the factor with the largest eigenvalue has the most variance and so on, down to factors with small or negative eigenvalues that are usually committed from solutions.

Therefore, factor 1 explains 29.185% of total variance as shown in the table 4.25. It should be clear that the first few factors explain relatively large amount of variance, especially factor 1. The output show that the extracts all factors greater than 1, which leaves us with seven factors. The eigenvalues associated with these factors were again displayed in the columns labeled extraction sums of squared loadings. In the rotation sums of squared loadings table part (table 4.26), shows the eigenvalues of the factors after rotation has the effect of optimizing the factures structure. After extraction the first factors variance explain listed 12.963%, the next factors also listed up to factor component seven. As show in total variance table, from the total listed components the first seven components take 68.62% affected factors for e-Government websites users and visitors.

Table 4.25 Total Variance Explained

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.421	29.185	29.185	6.421	29.185	29.185	2.852	12.963	12.963
2	2.277	10.352	39.537	2.277	10.352	39.537	2.653	12.059	25.022
3	1.526	6.936	46.474	1.526	6.936	46.474	2.130	9.681	34.703
4	1.442	6.555	53.029	1.442	6.555	53.029	1.980	9.002	43.705
5	1.276	5.801	58.830	1.276	5.801	58.830	1.909	8.678	52.383
6	1.110	5.043	63.873	1.110	5.043	63.873	1.908	8.675	61.058
7	1.044	4.747	68.620	1.044	4.747	68.620	1.664	7.562	68.620
8	.849	3.857	72.477						
9	.772	3.508	75.986						
10	.709	3.222	79.207						
11	.656	2.981	82.189						
12	.616	2.799	84.988						
13	.512	2.328	87.316						
14	.488	2.217	89.533						
15	.422	1.917	91.450						
16	.371	1.689	93.139						
17	.343	1.558	94.697						
18	.297	1.351	96.047						
19	.289	1.312	97.359						
20	.216	.983	98.342						
21	.201	.912	99.254						
22	.164	.746	100.000						
Extraction Method: Principal Component Analysis (PCA).									

The screen plot is shown in the Figure 4.6, with a thunderbolt indicating the point of inflexion of the curve. This curve begins to tail off after seven factors, but there is after eight factors before a stable plateau is reached. That examines the visual of the total variance associated with each factor scores. The steep slope shows the large factors; therefore, the first seven factors were main identified factors of e-Government websites usability. The gradual trailing off (screen) shows the rest of the factors usually lower than an eight value of 1.

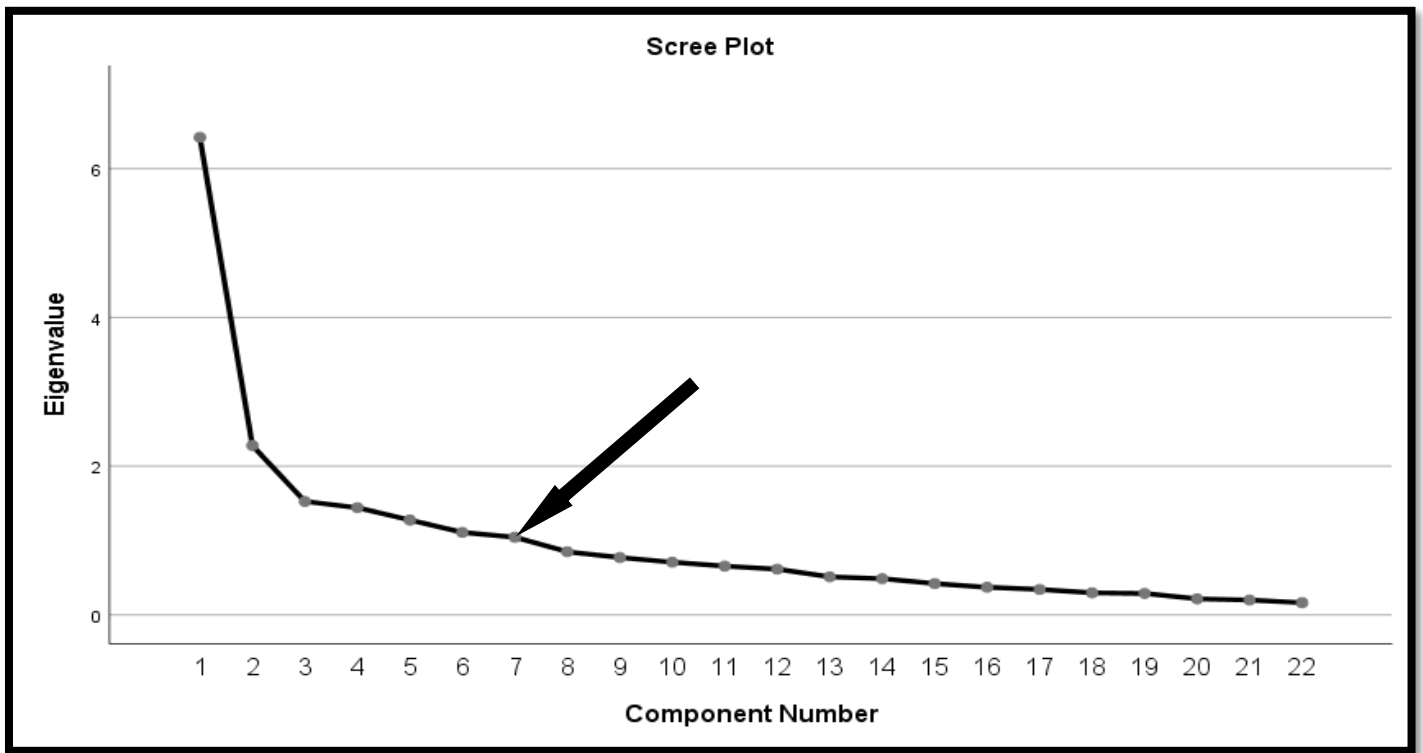


Figure 4.6 Factor Analysis Screen Plot Graph

4.2.5.2 Interpretation of Factor Analysis Rotated Component Matrix

The main identified usability factors of e-Government websites for end-users were shown in the table 4.26 below, that indicates the factors with seven ranked merged collection as follows: 12.96% of identified factors were associated with *‘website dead links, under construction pages, no updated information and lack of organized help messages’*. 12.06% of identified factors were associated with *‘uneasy and unattractive websites and not design for all level of service users’*. 9.68% of factors were associated *‘uneasy to find information, unreadable font size’* and *uneasy memorable URL address’*. 9.0% factors were associated with *‘not strictly decorated and not highlight the most important contents’*. 8.68% of factors were *‘icons and links are not meaningful, language problems and not saving time for completing the task’*. 8.68% of factors were *‘lack of full content, not simple navigation menu, uneasy links’* and finally 7.56% factors were *‘unclear back link on each pages and the user’s needs technical support for using the services’*.

Table 4.26 Factor Analysis of Rotated Component Matrix

Rotated Component Matrix^a							
	Component						
	1	2	3	4	5	6	7
No dead links	.810						
No "Under Construction" Pages	.703						
Websites have integrated mistake correcting systems	.619						
Websites have up to date information	.617						
Websites have "Help" messages on the screen	.514						
The overall organization of the site is easy to understand		.848					
This website is visually appealing (attractive)		.634					
Websites are designed for all levels of users		.537					
I felt very confident using the website							
Memorable URL for home page			.831				
It is easy to find the information/ service which is related to the task			.589				
Font is readable size			.526	.525			
Visuals serve purpose and are not strictly decorate				.813			
The e-government websites highlight the most important content at the main page.				.583			
Icons and links on the e-government website provide meaningful information to me					.730		
The language of the website was understandable and appropriate					.653		
The e-government websites save my time for completing the task					.636		
The content of the website met my expectations						.810	
Navigation menu is simple and straightforward						.537	
The links are easy to find						.522	
I think I would need technical support to be able to use this website							.850
There is a clear back link on each page which leads to the homepage							.539
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 11 iterations.							

4.3 Expert-Based Evaluation

Heuristic evaluation is an often-used usability inspection method on account of its relative quickness and cheapness compared to other methods. Moreover, Jakob Nielsen's ten usability heuristics are useful when evaluating the user interface design. As the goal of the expert-based evaluation was to identify potential usability problems of Ethiopia government portal (www.ethiopia.gov.et) by using the ten "Golden Rules" Nielsen's Heuristics (Nielsen, 2006); as discussed in chapter three, section 3.4.3.

➡ Stage III: Expert Based Evaluation Analysis Report

Ethiopian Government Portal (www.ethiopia.gov.et): -

Ethiopian Government Portal (www.ethiopia.gov.et) is a national portal provides information and services which are created and maintained by various government and non-government organizations. The portal is developed by Ministry of Communicational and Information Technology, to become the channel of choice for government and non-government online services as one stop shop for online services. As well it has vision of providing informational, interactive and transactional services and to be the highest preferred customer centric channel of delivery providing convenient and easy access to the services through establishing electronic ways of linking people with the public and private services.

➡ Evaluation procedures and investigation output

The IT experts for evaluation were selected purposively based on Jakob Nielsen's heuristic evaluation principles'. The selection was made based on work experience (those who worked four years and above) especially in websites and other software design, portal administrations and with knowledge of usability and work in different e-Government application development projects were chosen.

Therefore, those evaluators experts were asked to go through the interface a number of times and examine and assess the efficacy of those elements of Ethiopian Government Portal (www.ethiopia.gov.et), based on the heuristics evaluation principle that contribute to a dialogue with main users and site visitors. Each evaluator spent about one up to two hours on the website

working through the standardized worksheet, as shown in section 4.3.1 and 4.3.2. They were asked to write their identified main usability problems and suggestions that would be seen as confusing or complicated by users. In addition, they were asked to give severity rating of heuristic violations as shown in Tables (4.27).

The assessments of the study were done as adapted from research study of Jennifer et al. (2013) and, analyzed as follows:

- First, response of the evaluators' expertise on severity rating of heuristic violations coded in Microsoft Excel Sheet, as shown in the tables 4.27 and 4.28.
- Second, the heuristic severity ratings (from 1 to 5) across all violations were summarized according to the number of expertise elected that severity level; compare all the heuristic violations levels of e-Government Portal, as shown in tables 4.29 and using bar graphs as shown in figure 4.7.
- Finally, summary of evaluators' main identified highlight issues on the violations of each heuristic principles were compiled, as shown in section 4.3.2 and screen shots web pages demonstration figures were presented, as shown in section 4.3.3.

All experts' evaluation sessions follow the same procedures and after their independent evaluation, a discussion was conducted with each evaluator to reach agreement on the usability problems that emerged from their evaluations. At the end the results of all experts' assessments were merged and complied. The expert-based investigation activities presented were as follows:

4.3.1 Severity Rating of Ten Usability Heuristic Violations

Table 4.27 Severities Rating of Ten Usability Heuristic Violations

Severity rating scale		Definition
1	⇒	I do not agree I do not agree that this is a usability problem at all
2	⇒	Cosmetic problem only Cosmetic problem only: need not be fixed unless extra time is available on project
3	⇒	Minor usability problem (Low Priority) Minor usability problem: fixing this should be given low priority
4	⇒	Major usability problem (High priority) Major usability problem: important to fix, so should be given high priority
5	⇒	Usability catastrophe (Fix Prior to Product Release) Usability catastrophe: imperative to fix this before product can be released

➡ Coded heuristic violations by category across severity rating identified by evaluators

As shown in the table 4.28 and the Figure 4.7 the usability problem could violate shows that error prevention and help and documentation of the important support information and FAQs were highest heuristic usability problems. User control and freedom and aesthetic and minimalist design were found to have less violation within the e-Government website.

Table 4.28 Coded heuristic violations by category averaged across raters identified by evaluators

No.	Heuristic evaluation principles	I do not agree	Cosmetic problem only	Minor usability problem	Major usability problem	Usability catastrophe
		1	2	3	4	5
1	Visibility		✓	✓✓✓✓		
2	Match		✓	✓✓✓✓		
3	Control		✓✓✓	✓✓		
4	Consistency		✓✓	✓	✓✓	
5	Error			✓✓✓✓	✓	
6	Recognition	✓	✓	✓	✓✓	
7	Flexibility		✓✓	✓	✓✓	
8	Aesthetic		✓✓✓	✓✓		
9	Recover		✓	✓✓✓✓		
10	Help and documentation		✓✓		✓✓✓	
Number of Heuristics Violations		1	16	23	10	0
Percentage of Heuristics Violations		2%	32%	46%	20%	0%

Table 4.29 Total severity rating across all expertise's identified heuristic violations

No.	Heuristic evaluation principles	I do not agree	Cosmetic problem only	Minor usability problem	Major usability problem	Usability catastrophe	Total severity rating across all expertise's evaluations
		1	2	3	4	5	
1	Visibility		2	12			14
2	Match		2	12			14
3	Control		6	6			12
4	Consistency		4	3	8		15
5	Error			12	4		16
6	Recognition	1	2	3	8		14
7	Flexibility		4	3	8		15
8	Aesthetic		6	6			12
9	Recover		3	12			15
10	Help and documentation		4		12		16

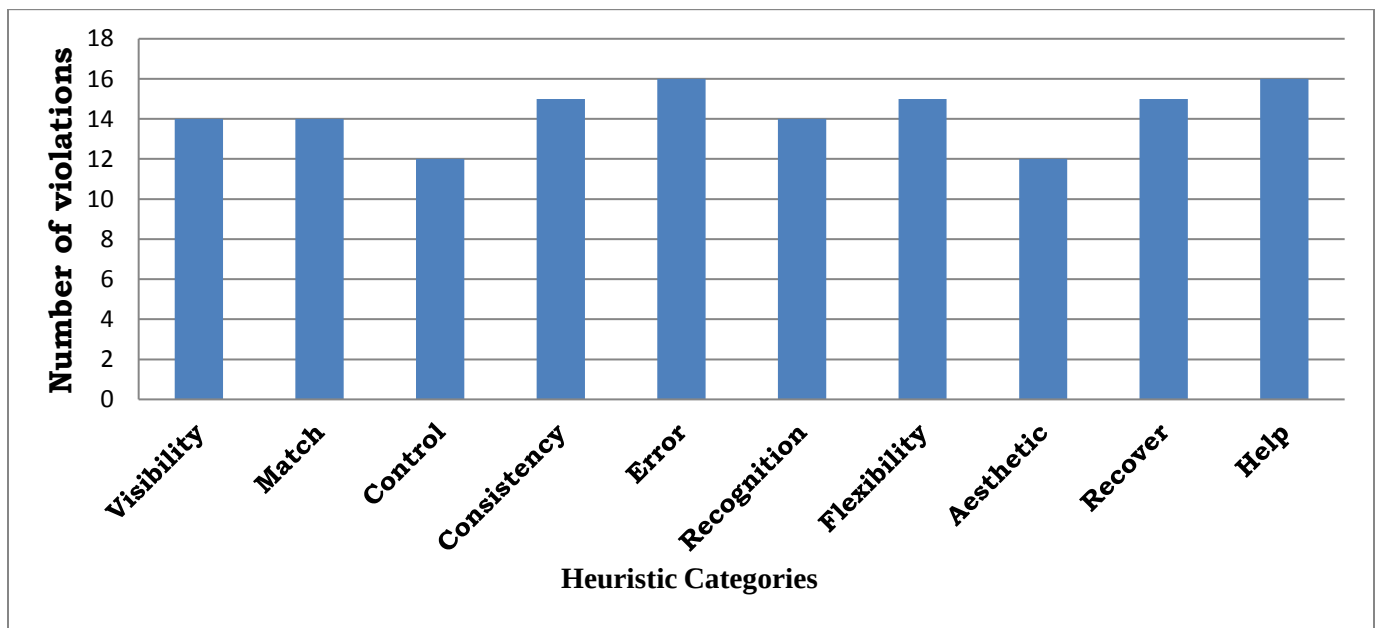


Figure 4.7: Usability Violations Rates According to Heuristic Evaluation Category

Figure 4.8 show the frequency of the severity ratings assigned to the usability problems of the e-Government website services. Of the 50 total usability problems identified, the raters found 78% to be between a “Minor Usability Problem and Major Problem”. 0% or No identified severity ratings for “Catastrophe and Not Usability Problems” and 32% of the total identified problem was “Cosmetic Problem Only”.

Overall, from the identified usability problems “*Help and Documentation, Eliminate of Error, Consistency and Standards, Recognition Rather than Recall, and Flexibility and Efficiency*” were the major identified problems. Therefore, needs to be giving more attentions and improved from the e-Government websites services.

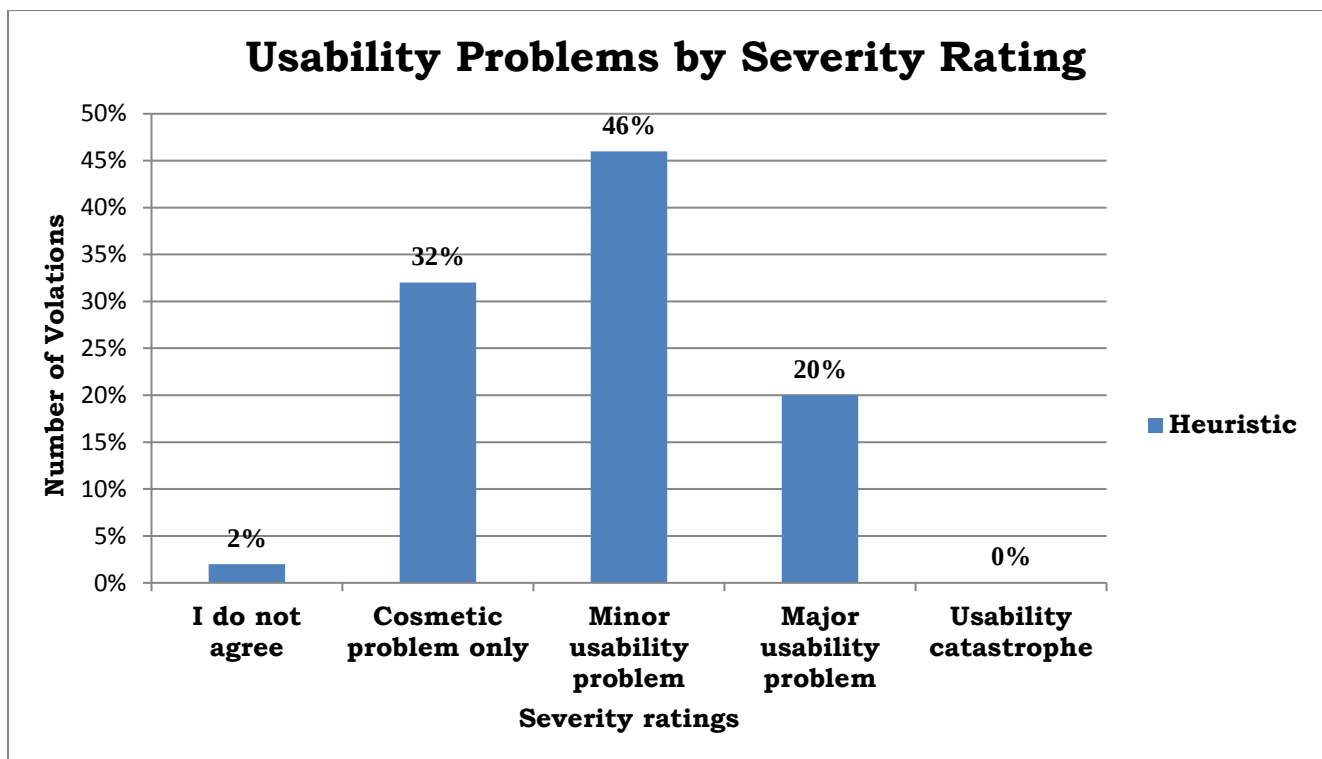


Figure 4.8 Identified Usability Problems by Heuristic Evaluation of Severity Rating

4.3.2 Expert Based Evaluation Standard Worksheet

➔ Source:- (<https://nngroup.com/articles/ten-usability-heuristics/>)

Evaluators' Main Identified Issues Based on Jakob Nielsen's Ten Usability Heuristics Usability Evaluation of E-Government Portal (www.ethiopia.gov.et)

[1] Visibility of system status:

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Experts' issues:

- The default size of font for the “New” menu text is so small that many of the words are difficult to read, as show in the **Figure 4.10**.
- The font color of all the text were all in blue, and light design techniques used may be difficult to view and/or understand without a color monitor or if the user was color blind
- Some images were not optimized properly
- Background images correspond to the selected active area on the main page
- Several pages on the site take a significant amount of time to load depending on the user's connection.
- The site generally preserves top navigation through when you use the side directly location change but there is no way to tell what directly subpage you are under

[2] Match between system and the real world:

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

Experts' issues:

- When the language menu selected (Amharic, English, Oromiffa and Tigrigna) the ‘News’ menu display only with Amharic language, cannot change in to other languages, (News displayed only in Amharic language), as shown in **Figure 4.10**.
- All interfaces graphical design of the linked government websites has the similar layout design formatting, they were not customized or changed based on the organizational main role and activities.
- No updated daily information menus or display related to different issues, like the weather forecast, IT, security or business related daily issues; those matches with day to day life of the citizens or visitors.

[3] User control and freedom:

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo, redo and cancel

Experts' issues:

- The system gives freedom to the user for changing/adjust size of fonts at the top left side of the windows, as shown the figure below. But, the users cannot change the font style (system restricts) as show in the figure below, as shown in **Figure 4.9**.
- There is no clearly marked emergency exit to back to home page once the user clicked learn more button

[4] Consistency and standard:

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions. E.g. layout of UI components should not change

Experts' issues:

- Text contained in the system is inconsistent. Some areas are all lower case, and others are normal (see figure). Lower case should be avoided since it is typically harder for the user to read
- Links to different areas within the website do not follow any of the established web standards. Links are neither underlined nor blue in color.
- The homepage did not standardize necessary characteristics to be easily perceived as a homepage.
- Using vague references link text
- Navigational consistency also lacking

[5] Error prevention:

Eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

Experts' issues:

- Several links do not work, misleading links, ..., as shown in **Figure 4.16 and 4.18**
- Unlike standard links, these broken links were not active and could be confusing to the user. Based on the online dead link checker, like:
 - <https://www.deadlinkchecker.com/website-dead-link-checker.asp>
 - <http://www.brokenlinkcheck.com/broken-links.php#status>
 - Above 100 dead link errors were identified (May, 2018).
- Ex: - On the home page: - the “SERVICES” Link redirectors to the “New” page display
- Did not use “Favorites” and “Recent Activity” lists to simplify navigation.
- Did not automatically validate data-entry values. When values are invalid, tell the user and indicate the correct range or format.
- Did not warn users about data value actions that could cause problems later.
- Error messages is always general with no indication as how to diagnose

[6] Recognition rather than recall

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate

Experts' issues:

- News Archive sub list done not have more information searching or browsing mechanisms apart from, **First / Previous / Next / Last**
- The portal did not implement clearly marked links formatting.
- Did not make labels and controls of currently inactive functions links, menus, ...
- Some lists and button did not have mouse-over tool tips to explain functions that are used infrequently.

[7] Flexibility and efficiency of use

The interface navigation should be simple and convenient to use. In addition, the system should provide different entry points for different user groups (such as different languages, culture, disabled people, etc.).

Experts' issues:

- The Home page screen is so large; the user has to scroll up and down arrows located on the left side of the title bar. There is no way to advance to the end of the page or return to the top.
- Not all links are connected, some link to a new window, some are broken and do nothing, and others give different messages, as show in the **Figure 4.11 and 4.14**.
- Did not make frequently-used items the first choice in lists.
- No “Favorites” lists for frequently used choices
- Sometime the portal services were down, not work efficiently based on the portal aims to serves as a 24 x 7 service delivery channel and ensure 24x7x365 availability with 99% uptime for the portal.
- In the portal there is no way of supporting special users group, like disabled people
- Lack of up-to-date information and information are not revision regularly by the concerned authorities, as show in the **Figure 4.10, 4.16**.

[8] Aesthetic and minimalist design:

The content on the screen should not be too crowded, because extraneous information on a webpage is a distraction and a slow-down.

- The bottoms of the page were too crowded with redundant information, links..., as show in the **Figure 4.15**.
- The design of the portal used more (all) blue color for background, text, and icons. This will make difficulties for blind peoples.
- Design of the portal uses the same icons with the federal government logo that the core application uses, which makes so redundant of the bullets.

[9] Help users recognize, diagnose, and recover from errors:

An error should be presented in a friendly manner, and its description should provide further operational recommendations to resolve the error

Experts' issues:

- There is no available contact information to the administrators of the websites/portals. (No contact email address, phone number, and fax number.) as shown in **Figure 4.13**.
- No online or embedded help activities.

[10] Help and documentation:

The important support information and FAQs should be placed at the appropriate location.

Experts' issues:

- FAQs did not place at the appropriate location and also when the link selected nothing is displayed, as show in the **Figure 4.12**.
- The resource menu not includes more resource documentations with different categories' and formats.
- The site uses an extensive number of acronyms but, there is little to explanation of what stand for what.
- The site did not have non-government organizations links, in formations and resources, based on the requirement of the portal's given one task as show in the **Figure 4.18**.

4.3.3 Screen shots of E-Government Portal Pages to Demonstrate Violation of Heuristic Rule

Figure 4.9 Font increasing and decreasing button did not change font style.

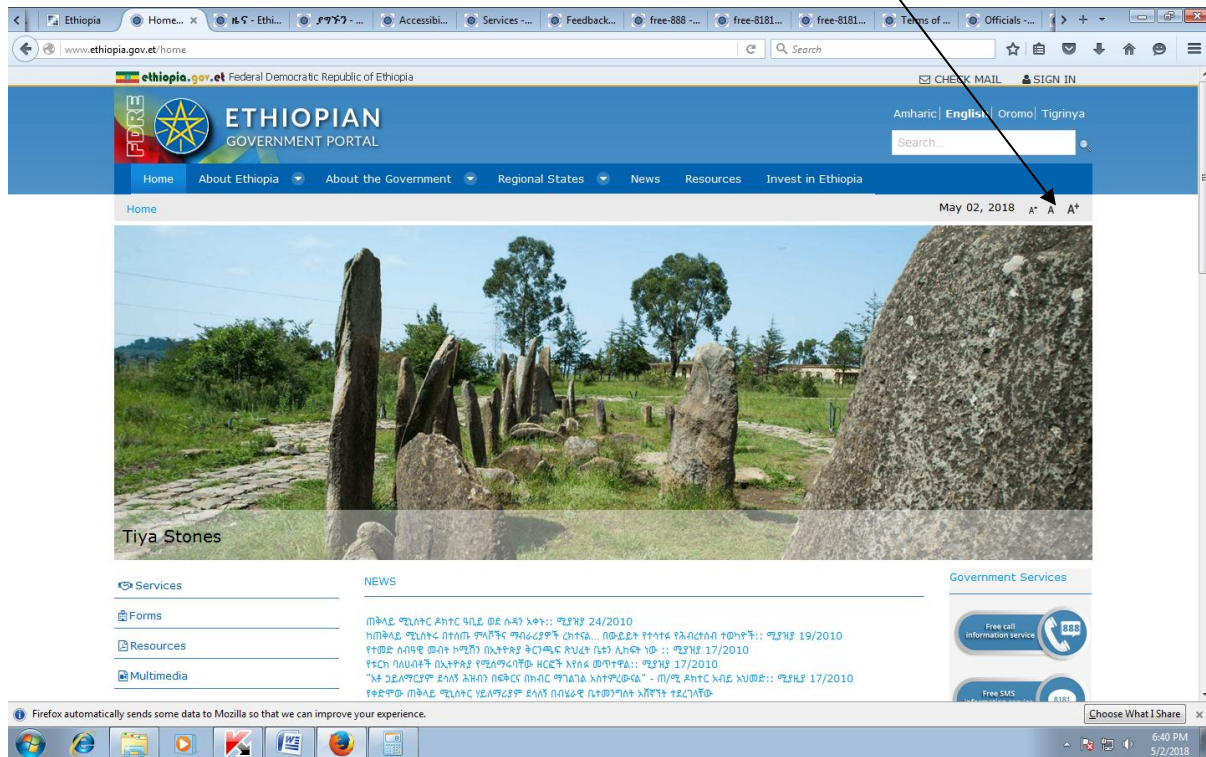


Figure 4.10 'News' menu display only with one language

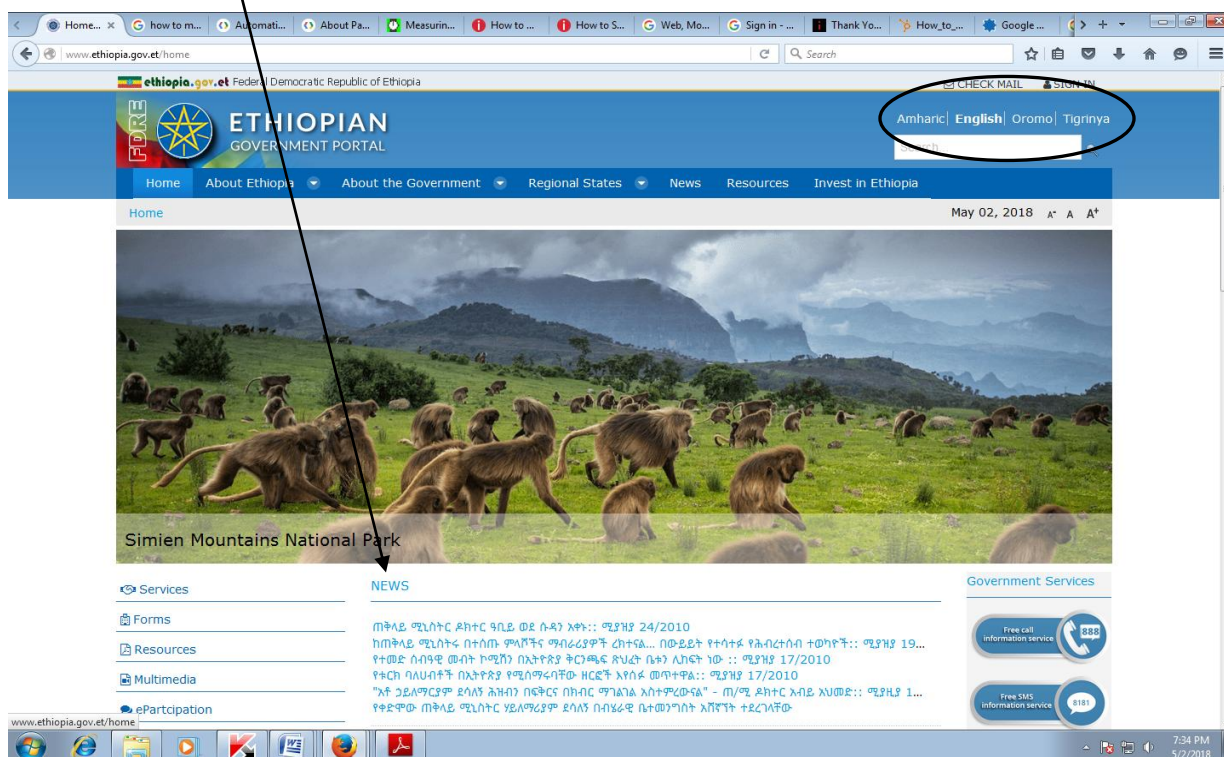


Figure: 4.11 Portal links a warning/error messages did not present in a friendly manner

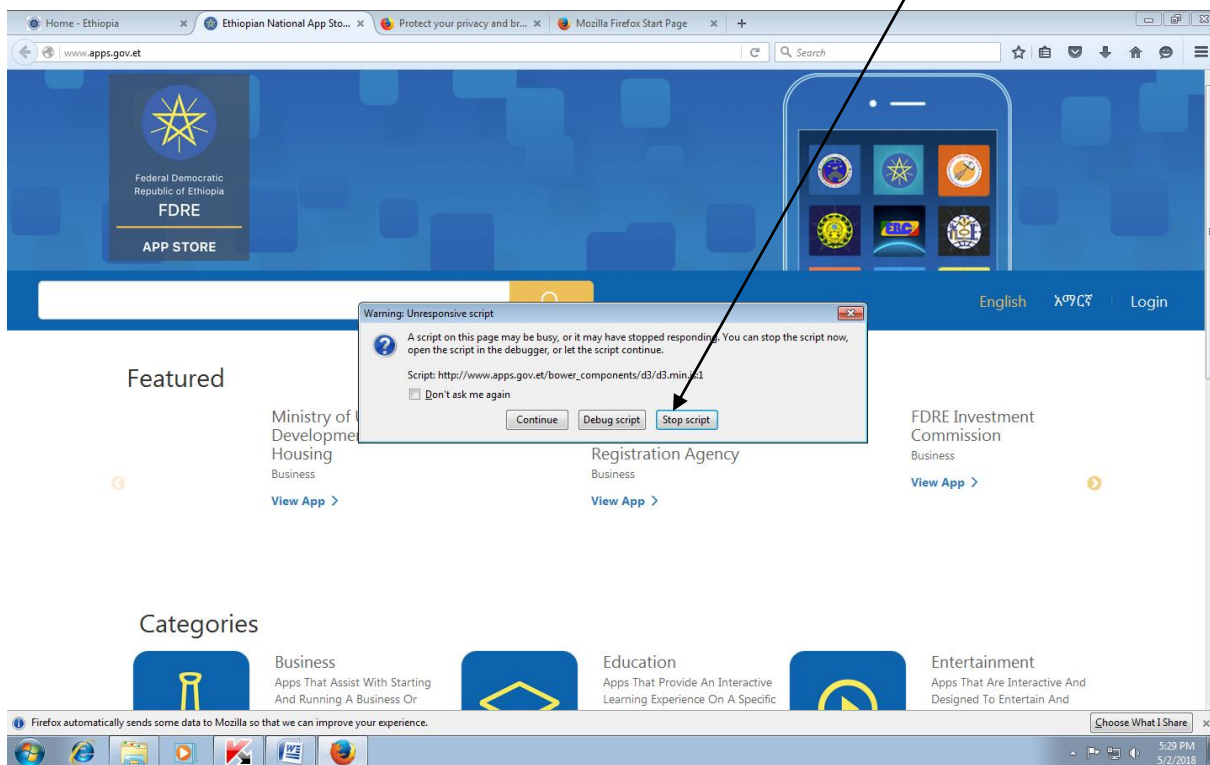


Figure 4.12 Support information and FAQs were not placed at the appropriate location and when the menu selected nothing was displayed.

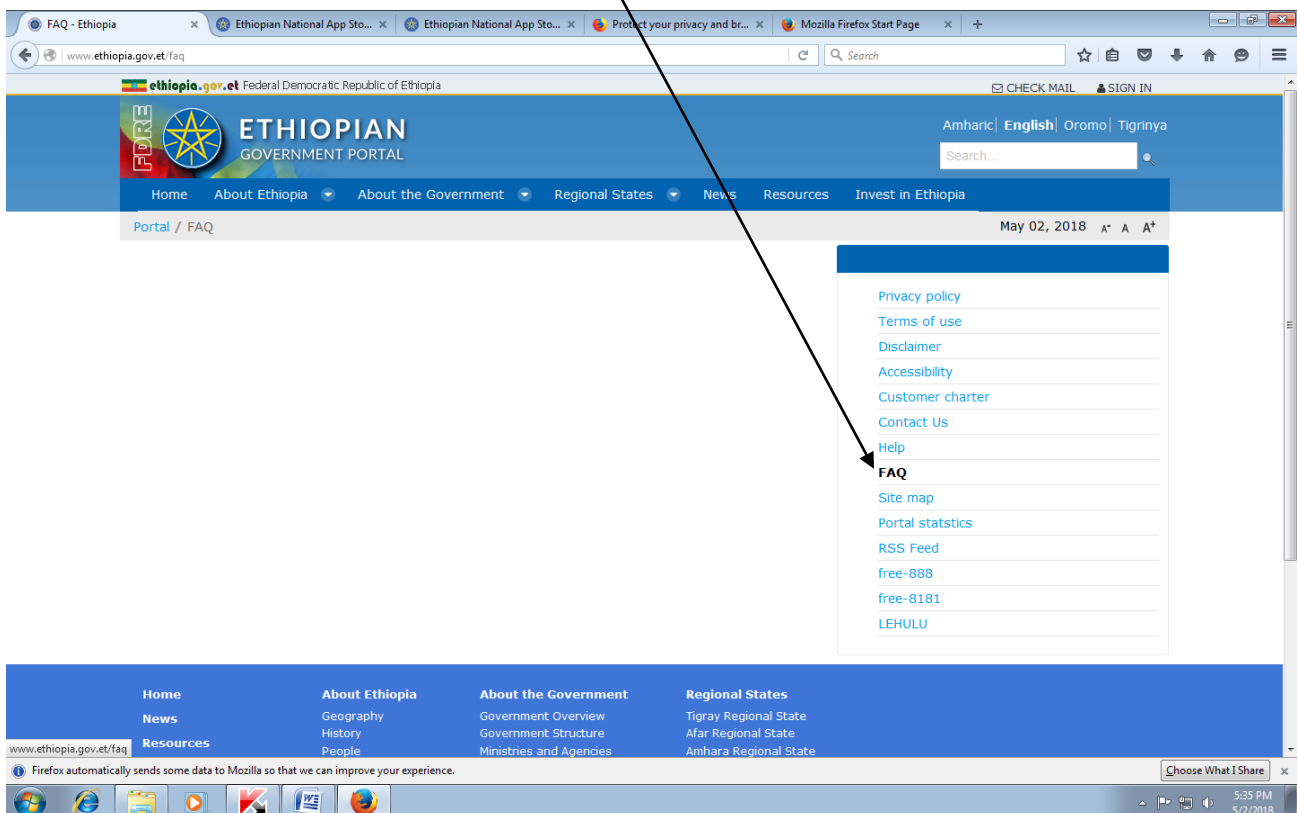


Figure 4.13 The **Contact Us** feature was displayed blank page in the portal.

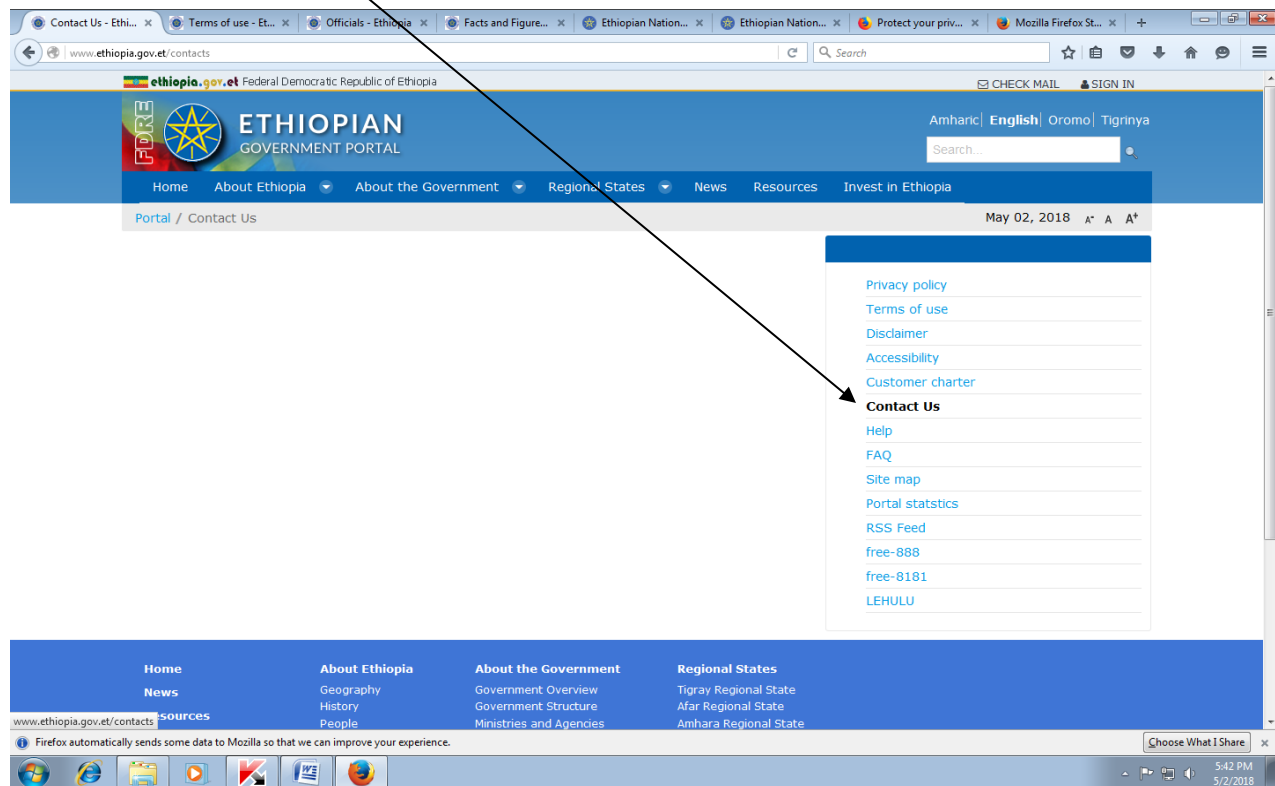


Figure 4.14 Portal Statistics menu was nothing display

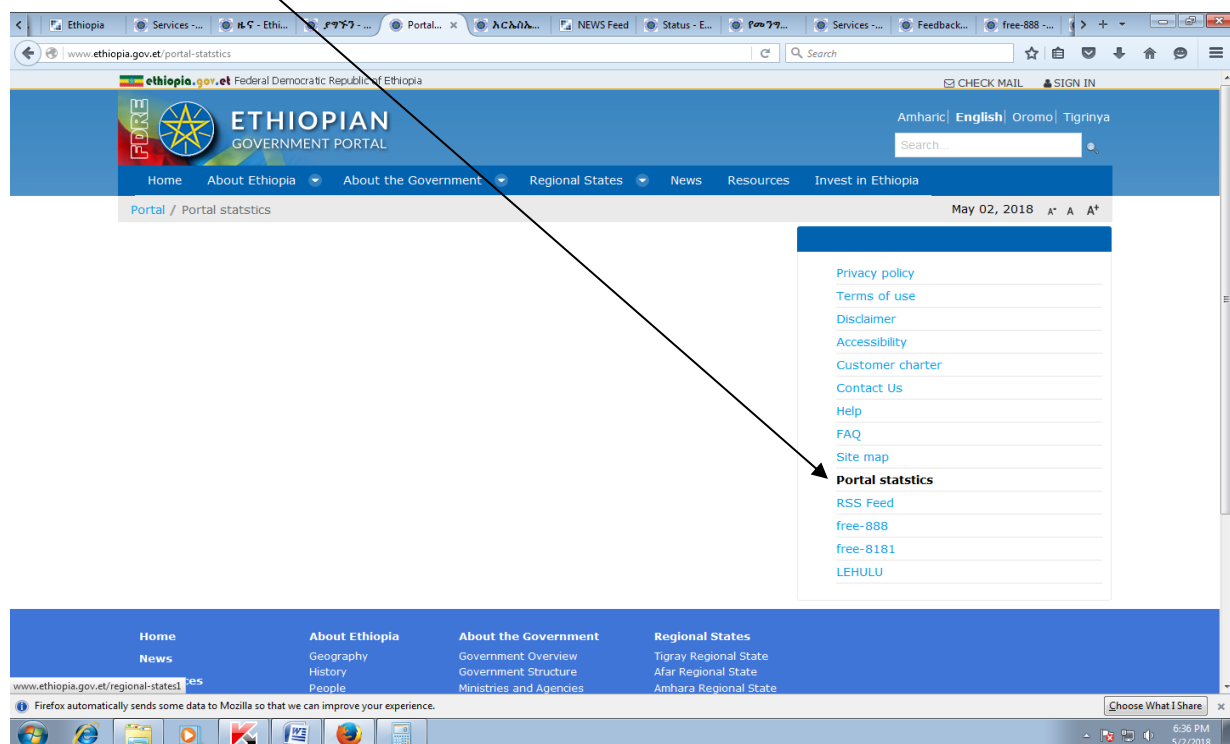


Figure 4.15 Bottom of the home page screen more crowded with redundant links and information



Figure 4.16 Government Services, button for **Free call information service (888)** and **Free SMS information Service (8181)** button links display the similar information pages

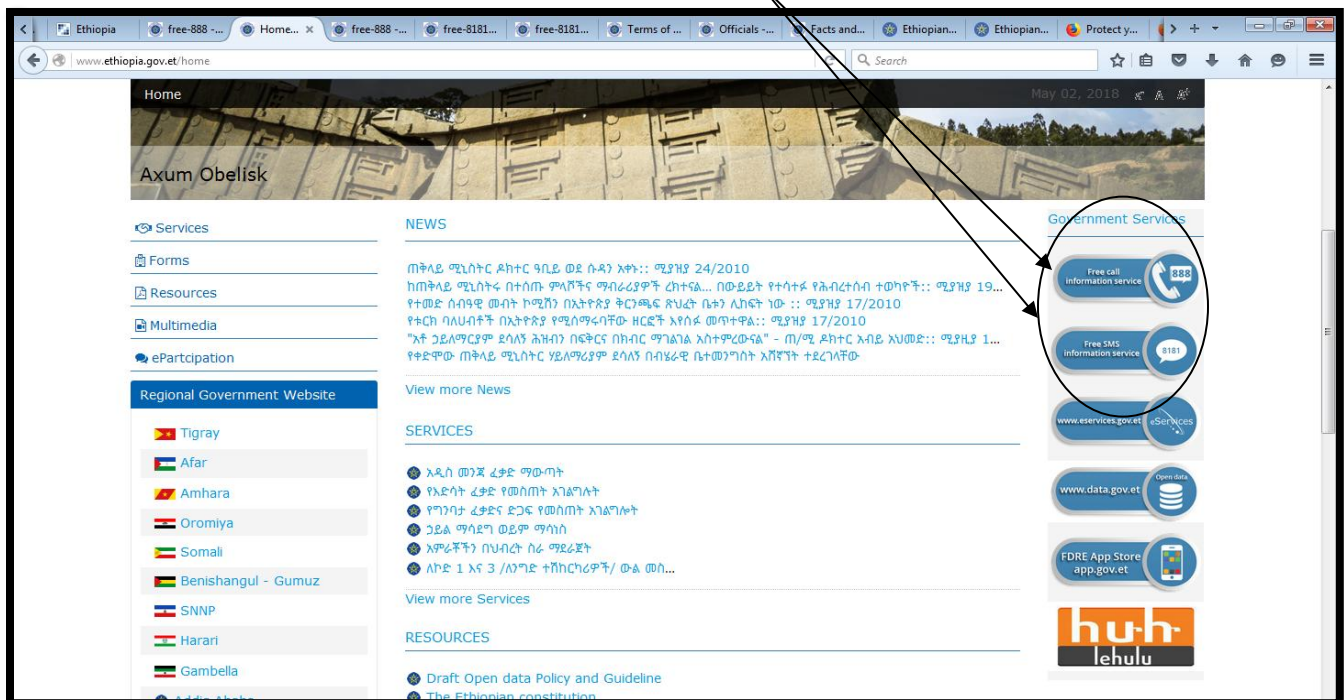


Figure 4.17 Government 888 Toll free Governmental Call Center display information

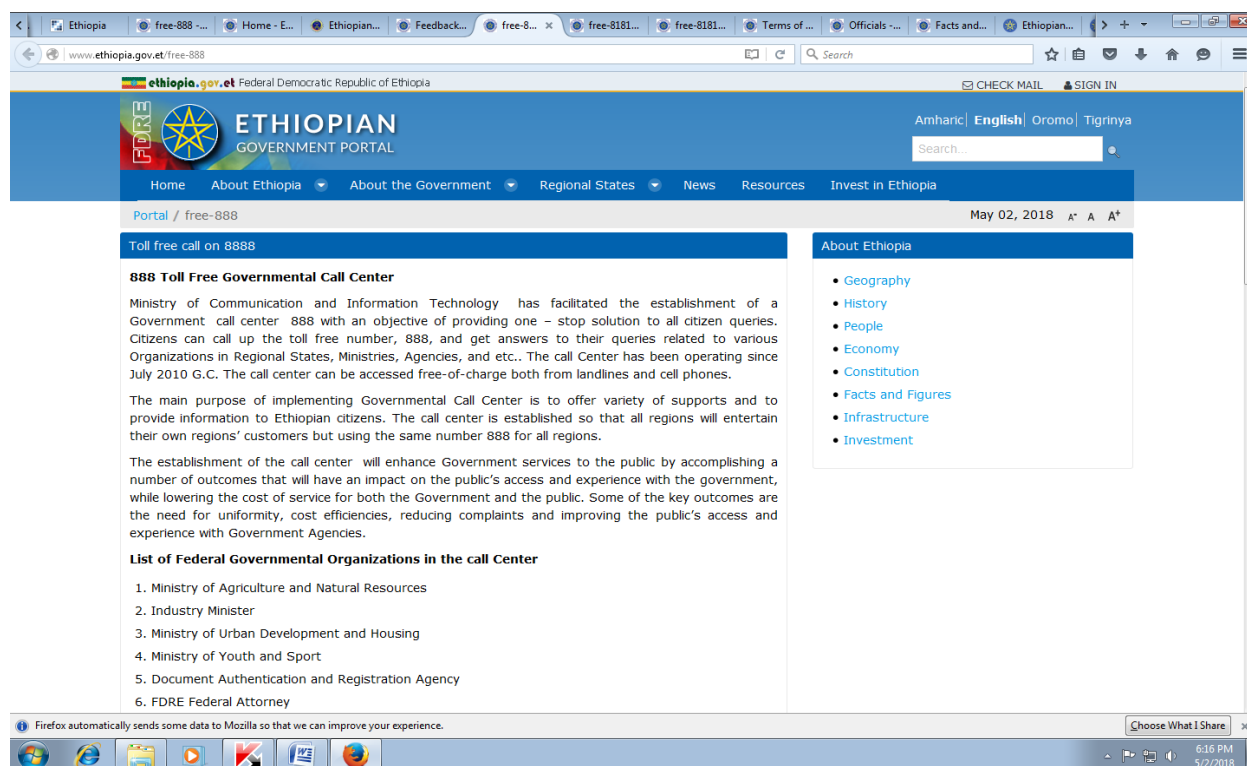


Figure 4.18 Ministries and Agencies Portals links (assessed: Wednesday, May 02, 2018),

- On the e-Government portal 55 government organization websites links (URL address) were listed on the portal. Most of the URL links functioning, but some organization links were broken, dead and redirects to other links, as shown in the Figure 4.19 and 4.20.



Figure 4.19. Ministries portal's services sometimes did not available or the link was not working
(assessed: Wednesday, May 02, 2018).

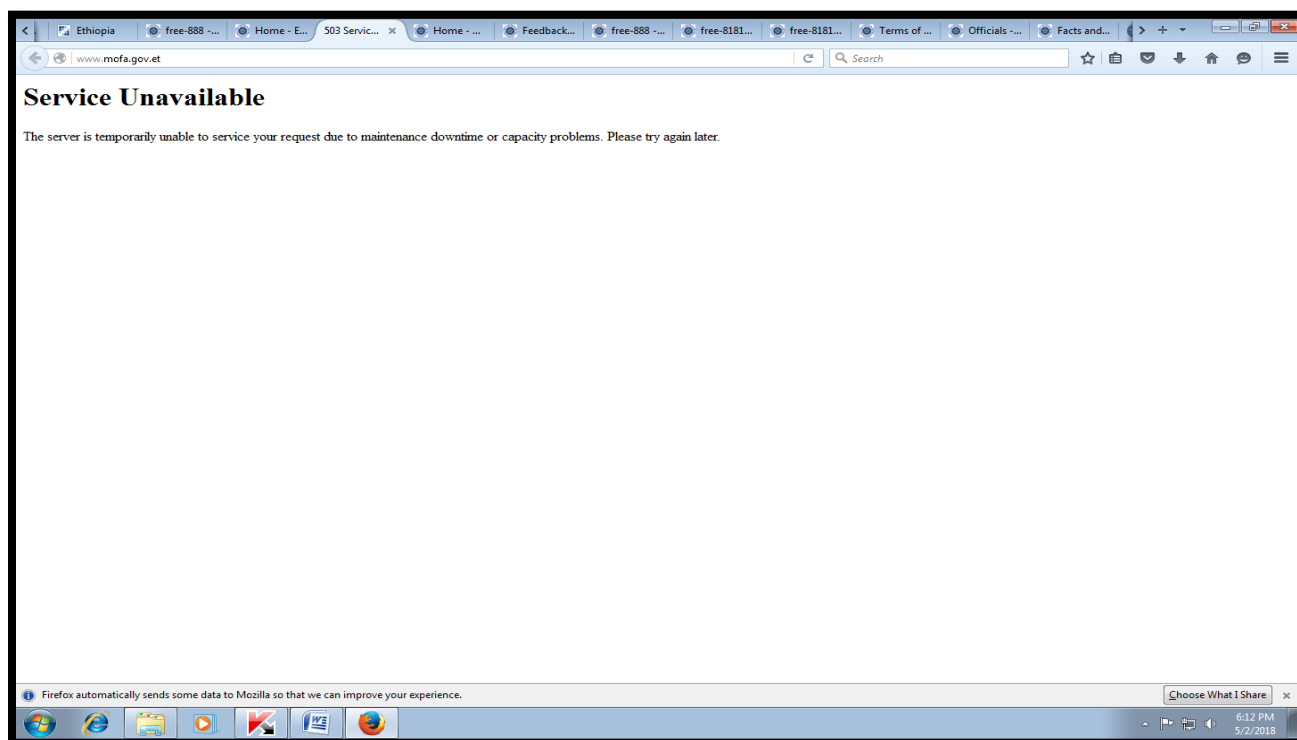
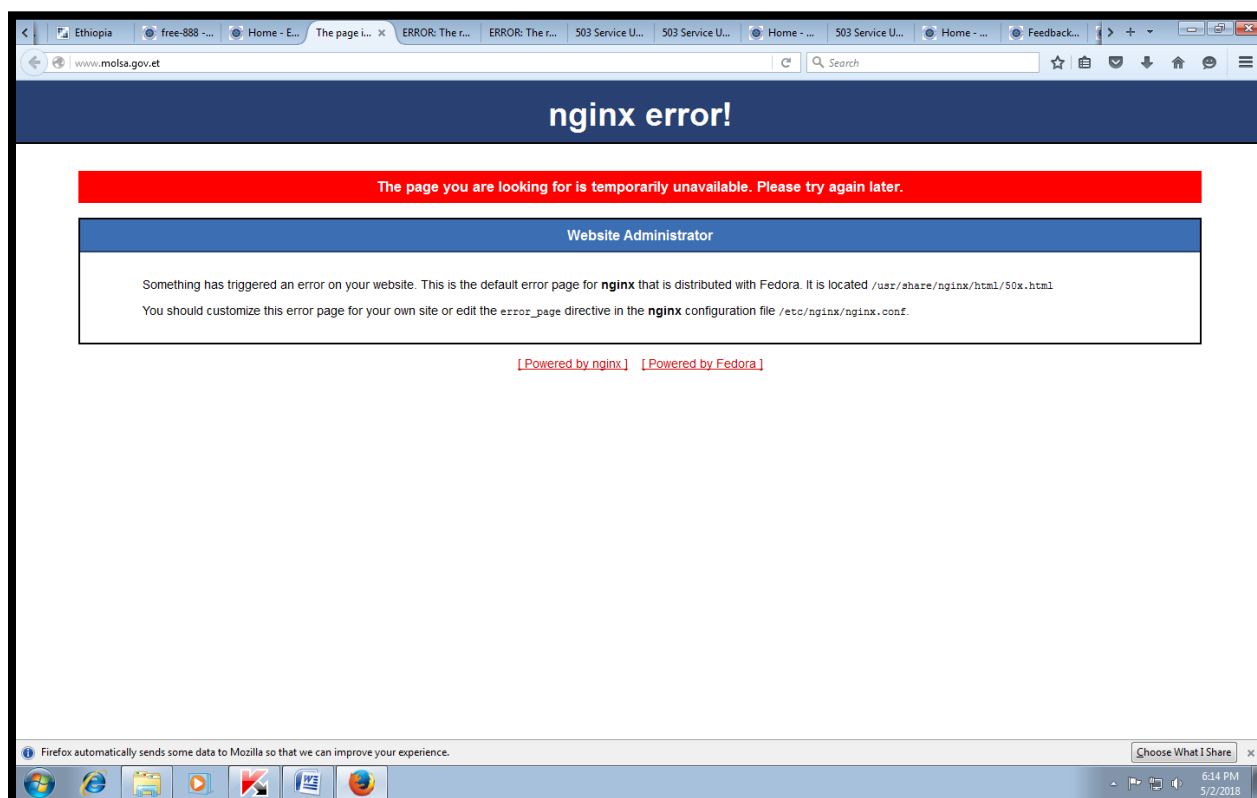


Figure 4.20 Ministries portal's services sometimes did not available or the link was not working
(assessed: Wednesday, May 02, 2018).



4.4 Automatics Accessibility Evaluation of E-Government Website

➡ Stage IV: Automatics Accessibility Evaluation Analysis Report

4.4.1 Overview of Web Accessibility Evaluation

When developing or redesigning a website or web application; evaluate accessibility early and throughout the development process, used to identify accessibility problems early and it is easier to address accessibility problems (W3C, 2009). Web accessibility evaluation tools are software programs or online services that are used to check the website's accessibility level under web accessibility guidelines. There are many evaluation tools that help to identify accessibility gaps and used to identify and explain the accessibility standards violated by websites.

In this section used online **WAVE Accessibility Tool**, based on Web Content Accessibility Guidelines (WCAG) 2.1, and assessed the accessibility of purposively selected sample of main Ethiopia e-Government National Portal gate (www.ethiopia.gov.et); and MOT (www.mot.gov.et); MOFA (www.mofa.gov.et) and MCIT (www.mcit.gov.et). Then, their accessibility evaluation summary and details report were prepared and presented, but at the time of this study of online accessibility evaluation of PSSA and FTA portals were not functioning in the time of this study process, as shown in figure 4.21 (*assessed time: May 04 2018, 10.19 A.M.*), thus, their summery report were not included.

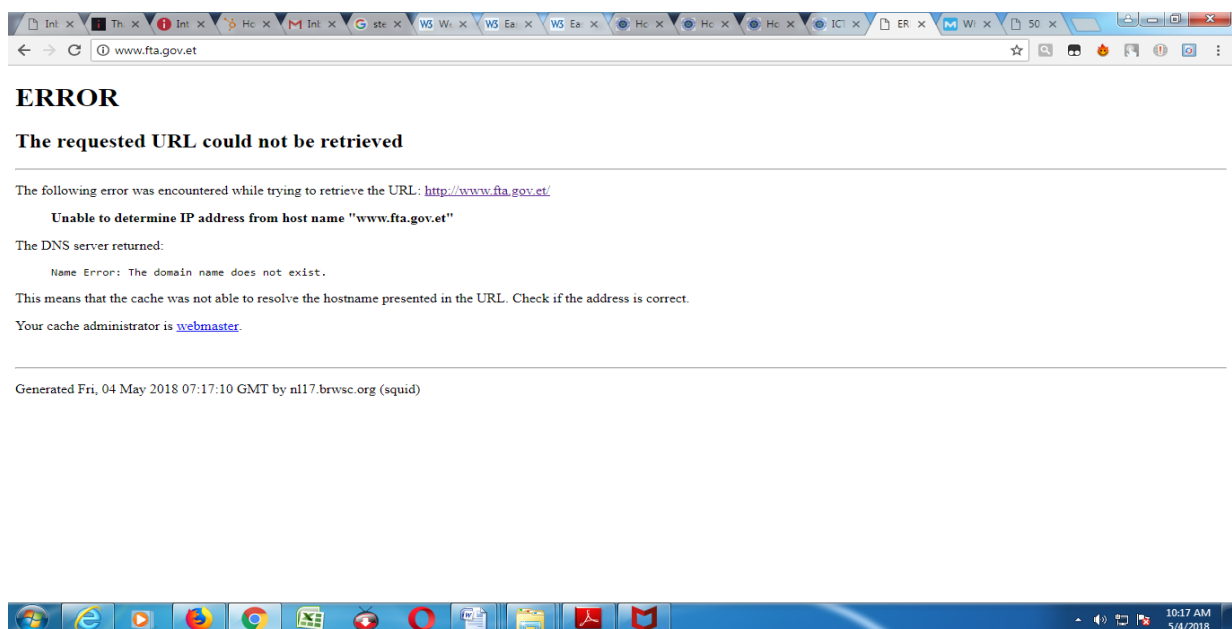


Figure 4.21 Authority web (www.fta.gov.et) was not functioning
(*assessed time: May 04 2018, 10.19 A.M.*)

➡ Assessment of Website Page Titles

Good page titles are particularly important for orientation to help people know where they are and move between pages open in their browser. The first thing screen readers say when the user goes to a different web page is the page title. As shown in the Figure 4.22, the title page of the e-Government websites was adequately and briefly describing the content of the pages and it distinguishes the page from other web pages.

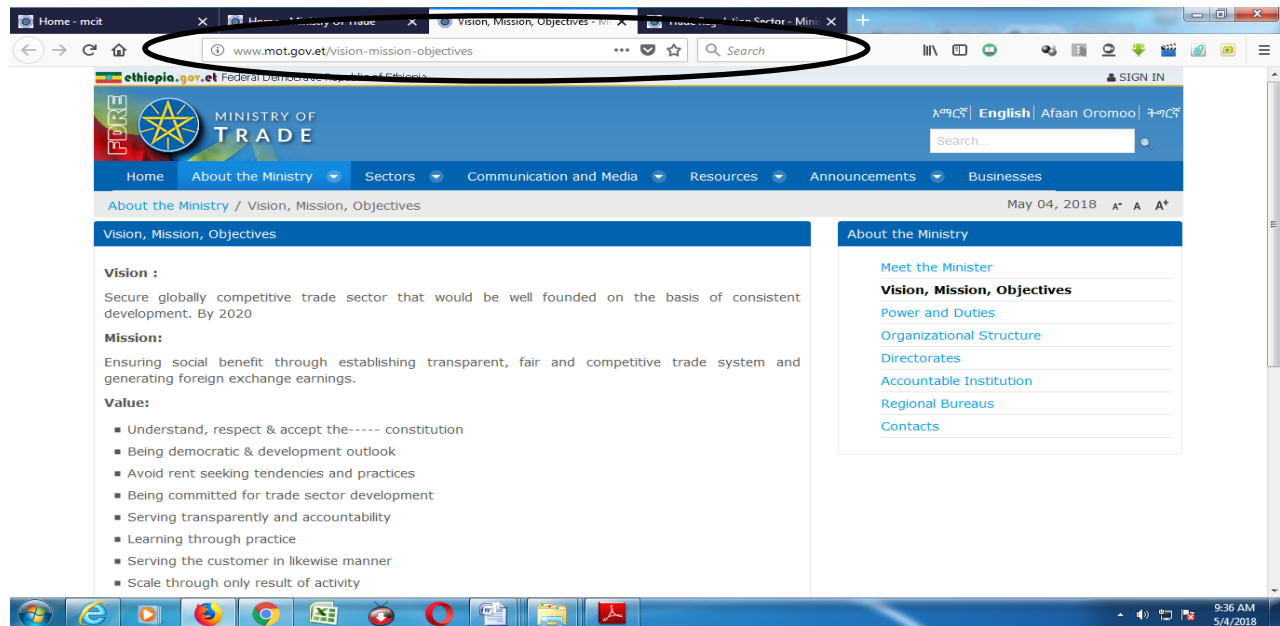


Figure 4.22 Title pages accessibility of e-Government websites (<http://wave.webaim.org/help>)
(assessed time: April 24 2018, 2.45 PM)

➤ Image text alternatives ("alt text")

Adding alternative text to photos is first and foremost a principle of web accessibility. Visually impaired users using screen readers will be read an alt attribute to better understand an on-page image (W3C, 2009). Based on Web Content Accessibility Guidelines (WCAG) 2.1 most of Ethiopian Government Portal photos and images have alternative test ("alt text"), as shown the picture 4.23 the home page of <http://www.ethiopia.gov.et/home> portal. But, based on WAVE analysis results 11 alternative test were missed or not available from www.ethiopia.gov.et portal as shown in the table 4.30 accessibility evaluation summary report.

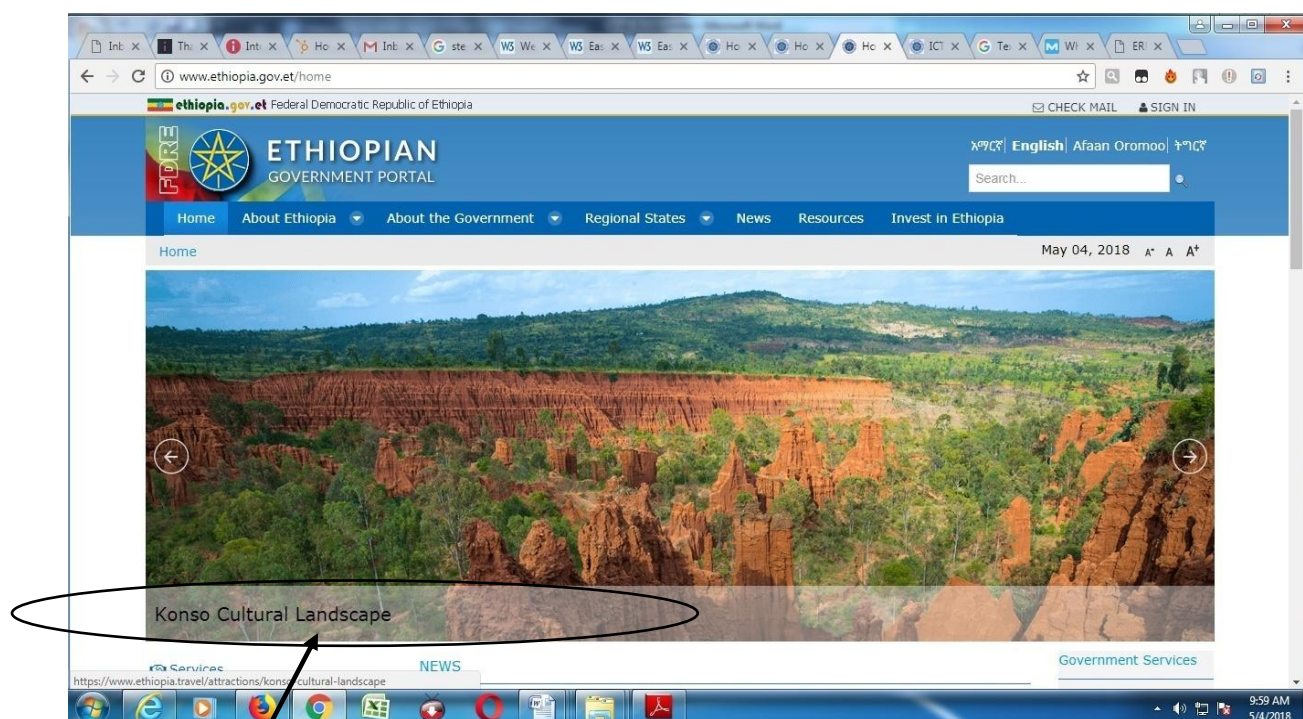


Figure 4.23 the home page of <http://www.ethiopia.gov.et/home> portal

<https://www.ethiopia.travel/attractions/konso-cultural-landscape>

In addition Ministry of Trade (www.mot.gov.et), Ministry of Foreign Affairs (www.mofa.gov.et) and Ministry of Communication and Information Technology (www.mcit.gov.et) websites' some images were text alternatives ("alt text") missing, as shown in the table 4.30.

➤ The detail web accessibility evaluation summary reports were presented in the table 4.30.

4.4.2 Accessibility Evaluation using WAVE Accessibility Tool

WAVE Accessibility Tool ¹¹ is a web service or browser extension that helps to evaluate and determine the accessibility of web content. WAVE is also used to check main issues of the websites, using WCAG 2.1 ¹² guidelines. WAVE Accessibility Tool checks some issues that extend beyond these guidelines. The WAVE accessibility evaluation tool home page address is <https://wave.webaim.org>, as shown in the figure 4.24.

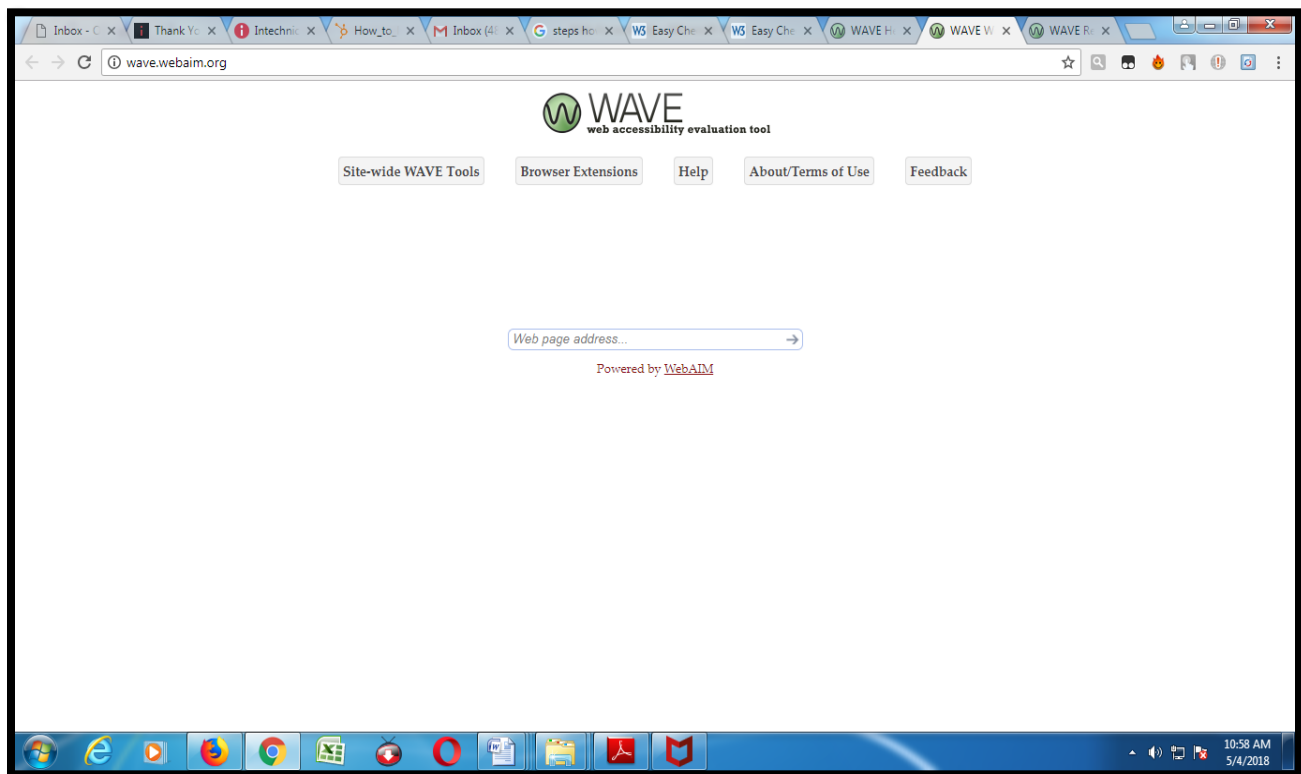


Figure 4.24: WAVE accessibility windows (<http://wave.webaim.org>) (accessed on: May 04/2018, 10:57 AM).

¹¹ <https://wave.webaim.org> (accessed on: May 04/2018, 10:57 AM).

¹² <https://www.w3.org/WAI/eval/preliminary#title> (accessed on: May 04/2018, 11:12 AM).

4.4.3 Websites Accessibility Evaluation Summary and Details Report

The web accessibility evaluation summary report via WAVE accessibility evaluation tool for Ethiopian Government Portal (<http://www.ethiopia.gov.et>), as shown in the figure 4.25, have 3 errors in link, 23 system design alerts, 50 features, 34 structural elements, 93 HTML and ARIA and 287 contrast errors, the details of each identified accessibility problems were listed in the right-side columns. The others selected ministries websites accessibility evaluation report result also indicated in the table 4.30.

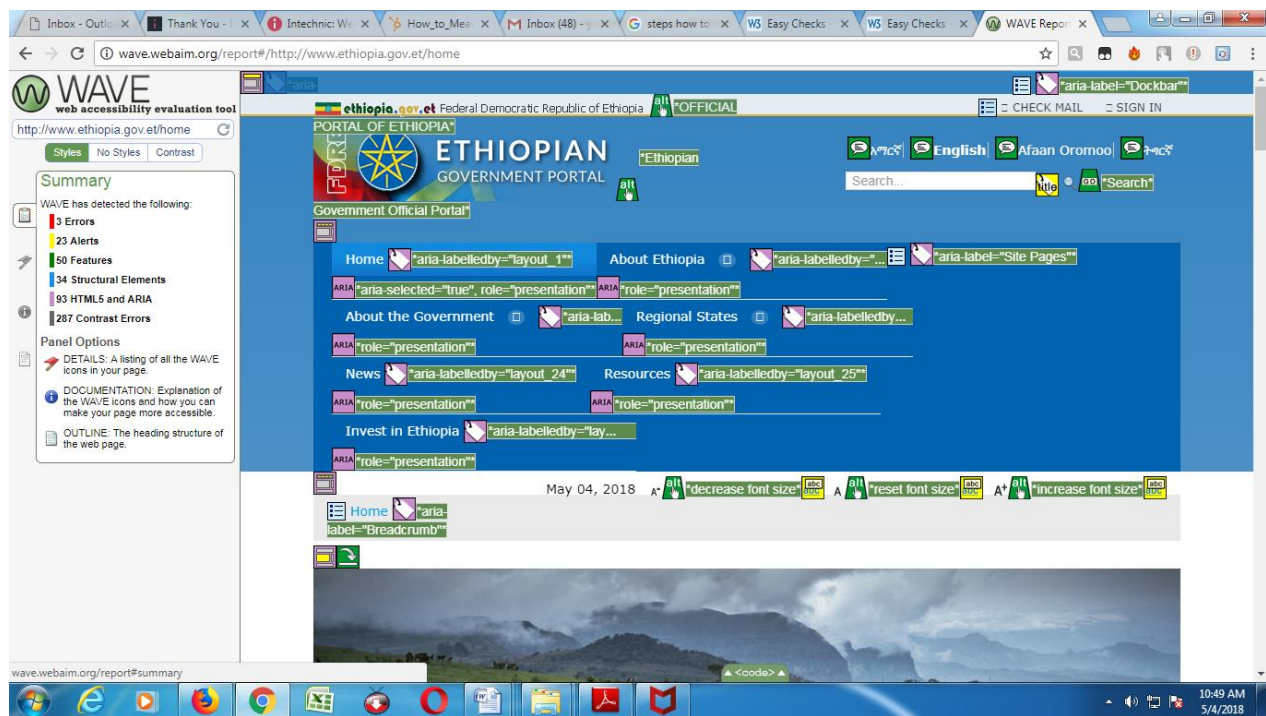


Figure: 4.25 WAVE: web accessibility evaluation tool summary report

(<https://www.w3.org/WAI/eval/preliminary#headings>, accessed on: May 04/2018, 10:57 AM).

Table 4.30: WAVE: Web Accessibility Evaluation Summary and Details Report

WAVE: web accessibility evaluation summary report (accessed on: May 04/2018, 11:30 AM)		
List of e-Government Websites	Detected Problems Summary Report	Detected Problems Details Report
Ethiopian Government Portal (http://www.ethiopia.gov.et) http://wave.webaim.org/report#/http://www.ethiopia.gov.et/home	WAVE has detected the following: 3 Errors 23 Alerts 50 Features 34 Structural Elements 93 HTML5 and ARIA 287 Contrast Errors	Errors (3) 3 X Empty link Alerts (23) 8 X A nearby image has the same alternative text 1 X Unlabeled form element with title 9 X Redundant links 2 X Device dependent event handler 3 X Redundant title texts Features (50) 11 X Alternative text 2 X Null or empty alternative text 30 X Linked image with alternative text 1 X Image button with alternative text 1 X Skip link 1 X Skip link target 4 X Element language Structural Elements (34) 2 X Heading level 1 32 X Unordered list HTML5 and ARIA (93) 3 X Header 2 X Navigation 1 X Main content 1 X Footer 40 X ARIA 44 X ARIA label or description 2 X ARIA tabindex
Ministry of Trade (www.mot.gov.et) http://wave.webaim.org/report#/www.mot.gov.et	WAVE has detected the following: 11 Errors 38 Alerts 57 Features 36 Structural Elements 89 HTML5 and ARIA 101 Contrast Errors	Errors (11) 4 X Missing alternative text 2 X Linked image missing alternative text 5 X Empty links Alerts (38) 4 X Justified text 5 X A nearby image has the same alternative text 1 X Unlabeled form element with title 1 X Skipped heading level 4 X Suspicious link texts 9 X Redundant links 11 X Device dependent event handler 3 X Redundant title texts Features (57)

		1 X Alternative text 38 X Null or empty alternative text 11 X Linked image with alternative text 1 X Image button with alternative text 1 X Skip link 1 X Skip link target 4 X Element language Structural Elements (36) 1 X Layout table 11 X Heading level 1 1 X Heading level 5 23 X Unordered list HTML5 and ARIA (89) 12 X Header 2 X Navigation 1 X Main content 1 X Footer 35 X ARIA 38 X ARIA label or description
Ministry of Communication and Information Technology (www.mcit.gov.et) http://wave.webaim.org/report#/www.mcit.gov.et	WAVE has detected the following: 11 Errors 63 Alerts 27 Features 31 Structural Elements 92 HTML5 and ARIA 81 Contrast Errors	Errors (11) • 4 X Missing alternative text • 2 X Linked image missing alternative text • 5 X Empty links Alerts (63) • 38 X Justified text • 3 X A nearby image has the same alternative text • 1 X Unlabeled form element with title • 4 X Suspicious link texts • 8 X Redundant links • 6 X Device dependent event handle • 3 X Redundant title texts Features (27) • 7 X Null or empty alternative text • 13 X Linked image with alternative text • 1 X Image button with alternative text • 1 X Skip link • 1 X Skip link target • 4 X Element language Structural Elements (31) • 1 X Layout table • 6 X Heading level 1 • 24 X Unordered list HTML5 and ARIA (92) • 7 X Header • 2 X Navigation • 1 X Main content • 1 X Footer • 1 X HTML5 video or audio • 38 X ARIA • 40 X ARIA label or description • 2 X ARIA tabindex

➤ Ethiopia E-Government Website Accessibility Evaluation Summary Results

Based on international standards for the design of Web Content Accessibility Guidelines, the WAVE accessibility evaluation summary and details report results as shown in the table 4.30, indicates that, the status of Ethiopia e-Government portals and websites have various accessibility problems, and violated accessibility standards (W3C WCAG). The major identified drawbacks were listed below:

- Lack of equivalent alternatives to auditory and visual content.
- Relied on color alone.
- Unclear, redundancy and empty navigation, link, header and content mechanisms
- Documents organizations were unclear and difficult
- Did not use markup and style sheets.
- Confuse language usage
- Lack of provisions of context and orientation information
- Design for device dependence
- Web structural and features elements problems, ... etc.

Therefore, results from this accessibility analysis research found that Ethiopia e-Government websites did not conform to international accessibility guidelines (W3C WCAG) and lack of capable design for disabled persons can access the information using Ethiopia e-Government websites. Web accessibility indicate people with disabilities can use the website, can perceive, understand, navigate, and interact with the website services (W3C, 2009).

The reasons behind e-Government website not conform to international accessibility guidelines were the organization concerned offices (ICT Development Department offices, Executive management, IT Experts and Developers) did not follow standardized e-Government website development or redesigning procedures. Moreover, as identified in the management perspectives study result, many government organizations did not practice programmed assessments of e-Government website usability and accessibility problems, based on standards like, Web Content Accessibility Guidelines 2.1 (WCAG 2.1).

CHAPTER FIVE

Proposed Model for Improving Usability and Accessibility of E-Government Websites in Ethiopia

In the previous chapter we have seen the data analysis results of the study, in this chapter, the proposed usability and accessibility model for Ethiopia e-Government websites was presented with five main components. The model was adapted from Jordan e-Government usability model (Bader, 2011), then modified, customized and upgraded based on the research finding, National e-Government policy and Ethiopia context. This proposed usability and accessibility model will use as a guideline or a roadmap for improving Ethiopia e-Government website services. With the first section of this chapter, the research main findings were presented, and then the proposed model and its components have been discussed in the next part of the chapter.

5.1 Research Findings

Based on the analysis result of research findings for proposal of the model from each study perceptive, with the key issues of usability and accessibility problems have been discussed as shown below:

5.1.1 Management Perspectives Study

The main identified challenges from management perspectives study were user requirement gathering problems, and lack of integration and practices between e-Government websites development and usability main issues. The lack of encouragement and support for webmasters or employees to improving services usability and accessibility by offering any incentives mechanisms, poor e-Government usability and accessibility awareness level and also lack of guidelines and standards in the organizations were the major identified problems, from management perspectives of the study result. Therefore, e-Government ICT management, head experts and designers (webmasters) have significant impact to fill those identified gaps; as a result, they were one of the key identified components of the proposed model.

5.1.2 Users Perspectives Study

The e-Government services users' usability and accessibility assessments result shows that: there was main challenge and problems of websites services for users and visitors. In general, the study analysis results indicate there were many problems starting from the incentive of the projects up to final e-Government websites' project development and services provisions, as it discussed in chapter four of this study analysis sections and as summary reported in chapter six. The most highlighted problems were user requirement gathering problems; websites appearance was visually unattractiveness, too much inconsistency, icons and links poor standardization and, unreadable font and extra decorative styles and also lack of update information and content. Hence e-Government users and customers' feedback have significant impact to give feedback for those identified gaps; as a result, they were one of the key identified components of the proposed model.

5.1.3 Expert Evaluations Study

The study concluded using expert-based evaluation result shows that, Ethiopia e-Government portals identified problems were more related with the usability identified factors by end users and customers and violate different Jakob Nielsen's heuristics usability rule. Therefore, these makes those problems were the key and valid factors of the e-Government services success and also as means of faller.

5.1.4 Automatics Accessibility Evaluation

The assessments of the websites accessibility were done using online WAVE Accessibility Tool with aligned of W3C WCAG 2.1 guidelines. The final assessment results show that the current status of Ethiopia e-Government websites accessibility have lots of accessibility drawback, and violate accessibility standard requirements, as discussed in Chapter four.

Since, those identified problems using experts and automatics evaluations tools were the key issues of e-Government websites services for lack of usability and accessibility. Therefore organize "Usability & Accessibility Evaluator Committee" with different stakeholders and expertise groups were one component of the proposed model.

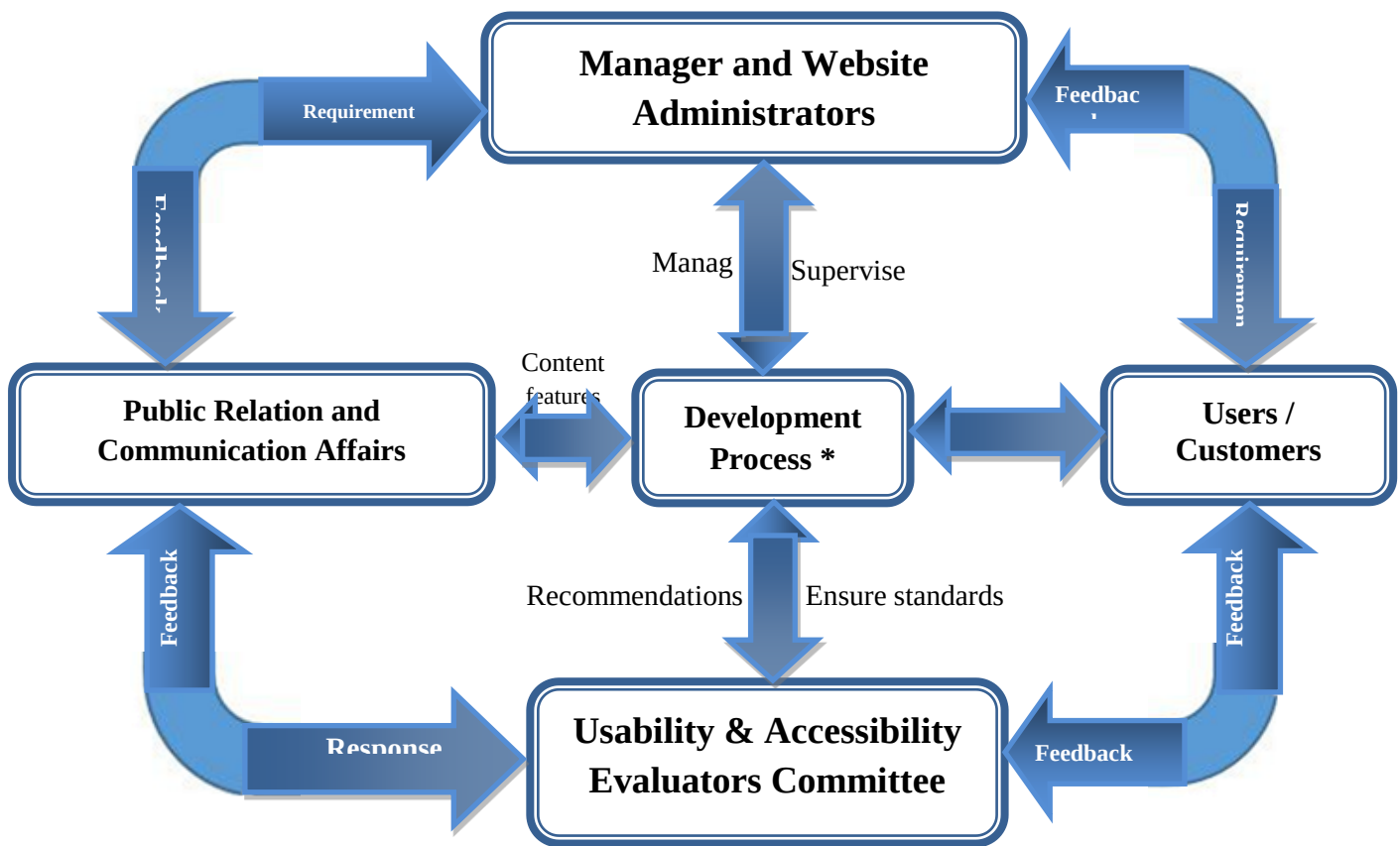
5.2 The Model

The Proposed Model for Ethiopian Government Organizations was for improving the usability and accessibility of their websites that will be used as a roadmap for giving a solution for those identified problems of e-Government website. Moreover, it has facilitated impact of usable and accessible websites' services for government organizations.

In this study, the proposed e-Government websites usability and accessibility models were adapted from Jordan e-Government websites models. Considered that the Jordan e-Government websites' usability gaps were more related to this thesis study results and its models main components were more related with Ethiopian government organization ICT department structures. Moreover, the Ethiopian government organizations budget, skilled man powers, government organizational administrative policy and e-Government strategy, and the last but the main things was as regard in this study analysis results from management, users and experts' assessments and automatic accessibility were considered in this model adaption process.

Thus, the Jordan usability models has four components, however in the case of Ethiopian adapted e-Government website usability and accessibility model contain five main components: "Manager and Website Administrators"; "Users"; "Usability & Accessibility Evaluator Committee" */lead by organization higher official's/ (stakeholders government institutes, public relation department, private sectors institutes)* "Public Relation and Communication Affairs Bureau" and "Development Process".

5.3 Ethiopia e-Government Website Usability and Accessibility Proposed Model



Development Process * (Gerry, 2006)

- **Plan:** Decide why the institutes develop a website and what to create.
 - **User Needs/Requirements**
- **Content:** Create a list of the content structure and features.
- **Design:** Create a design for displaying the content.
- **Pre-Implementation Test:** Make sure everything works properly.
- **Hosting:** Choose a domain name & find a place to put your site on the

Figure 5.1: Ethiopia e-Government Website Usability and Accessibility Proposed Model,
Adopted from Bader (2011)

➤ Main Components of proposed e-Government website usability and accessibility model

5.3.1 Manager and Websites Administrators

The most senior person on the website development and evaluation process team was the institutes IT Manager and senior web administrators. The IT manager reports directly to the higher official of the organisations and corresponding department to the head of Communication and Public Affairs Bureau.

As stated in chapter four the research analysis result indicates that, the institutes' IT managements and head experts' practice for e-Government websites usability and accessibility issues respondents for '**disagreement category**' were: 53.5% respondents for '*gives attentions to the end users requirements*', 44.2% respondents for '*survey done after launching for further improvement*' and 46.6% respondents for '*training given for the staff on websites usability*'. The **average** respondents for those three main e-Government websites management issues (*attentions to end users requirements, survey after launching and training*) were less than 50%, i.e. 48.1%.

Therefore, this indicates that ***the government organizations IT management members did not give enough attentions for those main usability and accessibility implementations issues, (as shown in the Table 4.12).***

Thus, get better understanding and function of managements were key factors of successful website usability and accessibility services. Based on this the role of those managers, web administrators or web masters in Ethiopia e-Government websites services were to translate national and organizational e-Government development strategy in to operations and drive development in pursuit of online goals. In addition, the web manager advises and leads the organization with reference to best practice of e-Government development, as well as emerging opportunities and threats.

Main responsibilities of those IT management members and websites administrators were plan for resources, budget and other administrative supports of the websites development and staff capacity building services. In addition to these, supervise the activity of the website development teams and project work flow, evaluate the performance of the web team, oversee the delivery of new developments for e-Government websites services including business modeling, requirements

definition, interface design and support and also communicate with internal and external stakeholders.

Additionally, the web administrators should consider the usability and accessibility issues from the user requirement perspectives and based on W3C, Web Content Accessibility Guidelines (WCAG 2.1). Those senior web administrators should also play a role of organizational e-Government websites services webmaster. The role of web team needs to support the delivery of online presences for e-Government website that are technically sound, designed to a high standard and developed in accordance with agreed standards.

In support of these responsibilities the manager and websites administrator's team should have enough experience, knowledge and competence, those able to supervision of e-Government websites and portals with high degree of quality.

5.3.2 Users' Feedback

Collecting feedback from end users were not only enables the improvement of websites usability and accessibility problems, but also used to archives overall organizational goals and whether the developed systems meets users' requirements. In the case of Ethiopian vast range of government services users, which are multicultural and multilingual, it's very hard to meet requirements and observations of users; without participation of the main stakeholders of the service end-users and establishment of structured, organized, reliable and usable systems.

Many websites services are interested in communicating with their users. There are many reasons that users might have for contacting a website, from reporting problems such as: broken pages, to asking for content updating and other issues. Many websites offer multiple ways for users to contact the website: via email addresses, phone numbers, physical addresses, etc. Sometimes, this contact information is even organized by department and provides the names of individuals to contact.

In chapter three of this study user satisfaction level and fulfillments of users' requirement were the major identified problems of e-Government websites services: from the participant of the study 79.1% respondents for "lack of feedback from end-users" were the major drawbacks, as shown in the table 4.10. Contact information and customer service information are extremely important for websites. In the users' perspective data analysis result of this study shows, e-mail and

FAQs were “not enough for the users’ feedback collection and communications mechanisms”. Not only this, most of the e-Government websites FAQs and ‘contact us’ menus did not working as identified in the expert-based usability evaluations sections, as show in the Figure 4.12. Furthermore, on the current status of e-Government services users were “dissatisfied” based on factors assessments study of this study results.

Therefore, in order to address those usability and accessibility problems and gain benefits, users’ requirements and views should be listened and also different communication mechanisms like *About Us*, *Contact Information*, *Searching* and *Customer Service Information* appropriately implemented. In this adapted e-Government website usability evaluations models also included “Users’ Feedback” as one key component of the proposed model.

5.3.3 Usability and Accessibility Evaluator Committee

Usability and accessibility evaluator committee (UAEC) was the committee for organizational websites governance that makes recommendations to higher official of the organization or the representative and the concerned offices. The UAEC was established by the higher official of the organization.

According to Bader (2011), the model suggested that there is a need to create a usability committee which consists of advisory members and executive members. The committee was suggested to be controlled by responsible government offices, such as the organizations higher officials or managements or regional ICTDA MCIT. The organized Usability and Accessibility Evaluator Committee would need to include the following office (bureau) head, directors or representatives: organizational higher officials’ ICT Sector coordinator’s (State Ministers or Deputy Director-General), ICT Development Directorates’ or Bureau, Communication and Public Relation Affair Bureau, Organizations Core Business Process Departments, Plan and Policy Coordination Directorates and Quality Assurance or Internal Audit Department. In addition to this, organization main stakeholders (government organizations, private company, public wing, sector associations’) representatives required to be permanent members of the committees. Others observers, administrative support and based on organizational structures main core department head will need to include.

This committee would not only serve to strengthen the website's overall effect, but would also explore effective ways to provide recommendations, implement the enhancements, provide suggestions and recommendations according to usability and accessibility principle requirements and feedback from end users and all stakeholders. Moreover, this committee required to work promotions of awareness creations on websites usability and accessibility to the organization staff, stakeholders, and the concerned higher officials.

5.3.4 Public Relation and Communication Affairs Bureau

In the case of Ethiopian government organization structure, major institute's actives and organizational information were communicated to the public by Public Relation and Communication Affairs Bureau. The ICT Office has a role of develop and implement e-Government services, and the organizational different departments and directorates implement and use those developed ICT services, including e-Government websites services.

In chapter four of this study, the analysis result from the participants of the respondents show that 64% for "Content of the website" were for 'disagreement' category. This indicates that the current status of Ethiopia e-Government websites' with "contents and updated information" were not satisfies organizational management and services users, as shown in Table 4.19.

Therefore, based on the main duties and responsibility of the Public Relation and Communication Affairs Bureau: required to facilitates and coordinate e-Government websites content preparation and information updating, and coordinate change control activity on web based public communication related activities. These include:

- Taking response of cooperate, lead and works as organizational web-based information spokesperson,
- Carefully collecting and making systematically documentation for share information using e-Government websites to the users,
- Using e-Government communication channel coordinate and facilitate the relationship between the organization and both domestic and foreign online media,
- Taking task to administrate photograph, audio-video and logo design for website service media, and

- Gives feedback to the IT department and designers, and usability and accessibility evaluator committee for improvement of websites usability and accessibility problems.

5.3.5 Development Process

Website Development is a process for creating a new website or implementing changes to one already in use, e.g. adding a significant new section to a live site. In simple terms, the process represents a framework within which all activities from inception to review.

According to Gerry (2006), main steps in websites development process are:

- **Planning:** Decide why you want a website and what to create, including users need.
- **Content:** Create a list of the content structure and features.
- **Design:** Create a design for displaying the content.
- **Pre-Implementation Test:** Make sure everything works properly.
- **Hosting:** Choose a domain name & find a place to put your site on the internet.

1. Website Planning

Website Planning is a process for identifying the business objectives and user needs that drive the development cycle. This is the first step for building a successful website. It allows you to explore some of the most fundamental issues of site development. For example:

- Why are we doing this?
- What value will our website produce (from the investment we are making)?
- Who is our audience?
- What do they want?

One of the most useful ways to identify the goals of organizations website development is convene stakeholders who have a strong interest in the website services. These people can then agree the reasons why a website represents good value. Moreover, setting smart goals for the organizational e-Government website services

➡ User Needs

Without doubt, the best way to establish the needs of a website audience is to get out and talk to them. This ensures the planned site will reflect “actual” user preferences, not those you think users want. Some of the most popular research techniques include:

- Online survey.
- Focus group.
- Examine website feedback.

2. Website content

Website content encompasses all the information and applications available on the e-Government website. So, with the coordination of ICT Development Department and Public Relation and Communication Affairs Bureau all the stakeholders need to give feedback and prepare website content features. After lists of features have been created, need to select formats for putting them online. The most widely used content formats on the web are: plain text, video, audio, flash, PDF and other.

3. Website Design

Website Design was composed of several distinct steps, each of which embraces a range of skills. In chapter three of users’ perspectives data analysis of this study identified the e-Government website design usability issues in the website design starting from the home page appearance, navigation, interface design (links, buttons, check boxes, etc), integrated mistake correction systems, information design, and search, content and over all services capabilities. Therefore, in this model focuses on these requirements as well as on the overall satisfaction of the e-Government website and designed for all levels of users

4. Pre-Implementation Test

As mentioned previously, most of management staff agrees with website usability testing, but their usability testing practices was not planed and not proper ways. So, this makes main problems of websites services quality drawback.

The goal of testing was to find and find as many faults as possible are prior to acceptance testing. According to Bader (2001), the ultimate goal developing usability evaluation is creation of

a functional, usable and sustainable website. By testing a website before its launch, one can ensure it is meeting its full potential.

According to User-centered design (UCD) process, outlines the phases throughout a design and development life-cycle, all while focusing on gaining a deep understanding of who will be using the product¹³. User-Centre Design approach, were the model has been recommended to be applied in the pre-implementation test (Bader, 2011). It consists of many techniques, including:¹⁴

- **Focus groups:** Focus groups are most often used as an input to design. They generally produce non-statistical data and are a good means of getting information about a domain
- **Participatory design:** Participatory design does not just ask users opinions on design issues, but actively involves them in the design and decision-making processes.
- **Questionnaires:** are a means of asking users for their responses to a pre-defined set of user satisfaction questions.
- **Interviews:** An interview usually involves one interviewer speaking to one participant at a time. In the interview process participants can raise unique point of view can be explored in detail.

In addition to UCD and before acceptance testing different testing catalogue need to implement like unit test, integration tests and system test. Moreover, based on this thesis accessibility problems finding in chapter four analysis results, e-Government website accessibility were the main identified gaps of the current Ethiopia e-Government websites.

Therefore, accessibility testing using different automatics evaluation technique need to be implemented to ensure that the website conforms to the stated level of accessibility outlined in the organization's Web Accessibility Policy. Familiar and international standardized open websites accessibility evaluation tools are WAVE¹⁵ Accessibility Tool and W3C¹⁶ Web Accessibility Evaluation Tools based on the standard of W3C, Web Content Accessibility Guidelines 2.0.

¹³ <https://www.usability.gov/what-and-why/user-centered-design.html> (accessed May 5, 2018)

¹⁴ <https://www.webcredible.coam/blog/user-centered-design-ucd-6-methods/> (accessed May 5, 2018)

¹⁵ <http://wave.webaim.org> (accessed May 5, 2018)

¹⁶ <https://www.w3.org/WAI/ER/tools/> (accessed May 5, 2018)

5. Website Hosting

Website Hosting refers to the service that allows a website to be stored on and accessed from the internet. The main reason to raised website housing in this model adaption process was as mentioned earlier, some e-Government website users not satisfied with the “memorable of URL address” or the “domain name” for home page. Therefore, organizational management and website expertise need to choose a short and easy to remember domain name in the hosting process.

5.4 Validation of the Proposed Model

The adapted and proposed model of Ethiopian e-Government websites was first validated by Bader (2011), as his point out that the proposed model has been reviewed and assessed by three groups. The first group consisted of the specialists in the e-Government project (15 participants). This represents the views of professionals in charge of managing the e-Government project in Jordan. The second group consisted of technical professionals (10 participants). The third group consisted of academics to reflect a broader view about the model (13 participants). At the end, 38 participants in total were recruited to participate in the model assessment”. Based on this process of model testing and validation, it was concluded that the proposed model was valid and capable of achieving usable websites in Jordan (Bader, 2011). Moreover, according to Bader (2011) the model was developed as it is one of the developing countries facing problems due to websites usability, like Jordan, Ethiopia, or other African countries.

Therefore, the adapted and proposed model has also been accepted as a valid roadmap for improving the usability and accessibility of e-Government websites in Ethiopia and takes it this in consideration for our proposed models. For the current instance no need of additional requirement for model validations. Moreover, the proposed Ethiopian e-Government website usability and accessibility model addressed the main challenges highlighted in this conducted study, to ensure the success of e-Government websites services in Ethiopia.

CHAPTER SIX

Summary, Conclusion and Recommendation

6.1 Summary and Conclusion

The aim of this research is to investigate the Ethiopia e-Government websites usability and accessibility problem with opportunities for improving performance. Furthermore, adapt and propose e-Government websites usability and accessibility model. With the aim of this research, we have used mixed methods of research study. In order to get different sides' clear possible usability and accessibility issues: four stages with different perspective study were implemented. Thus, management and user perspective evaluation study were applied and the data are collected using hard copy and on-line (mailing) questionnaires and semi-structured interviews. The sampling method for selection of organizations management and end-users are using purposive and convenience sampling selection method respectively.

Next, the experts-based evaluation using Jakob Nielsen's Heuristics evaluation rules are applied. The five senior website evaluators' experts were hired, for examine and assess the efficiency and functionality of user interface design and its usability of Ethiopian Government Portal (www.ethiopia.gov.et). All data collection sessions followed the same procedure, finally summary of each evaluator's main identified highlight issues on the violations of each heuristic principle were compiled and presented.

On the final stage, automatic web accessibility evaluations are applied. These web accessibility evaluation tools are used to check the e-Government website's accessibility level under standard web accessibility guidelines. In this study online WAVE Accessibility Tool is used, based on Web Content Accessibility Guidelines (WCAG) 2.1, and assessed the accessibility of sample selected Ethiopia e-Government website and portal.

Based on the above four stage investigations method, the final result of the study has contributed in presenting some essential findings related to Ethiopia e-Government websites usability and accessibility problem areas, and also proposed roadmap model that can play a major role towards future usable and accessible e-Government websites services. Moreover, the study

results may aware all the stakeholders of Ethiopia e-Government websites and portals managements, webmasters, content publishers and developers. That gives more emphasis on usability and accessibility features which are often being neglected. The study results from each stage of investigations are summarized below.

Based on different perspective study result, e-Government services end-users of the research participants' point of view, the main identified Ethiopia e-Government websites usability issues are:

- The e-Government website dead links, under construction pages, no updated information and lack of equipped help and support services,
- E-Government websites were not design for all level of service users, uneasy and unattractive layout design. In addition, poor visual appeal of the site and inconsistency throughout the site,
- E-Government websites design and development problems and also not highlight the most important web contents,
- Web icons and links were not meaningful and information not available in the most native language of the citizen (language problems),
- Unclear navigation and link functionality on most of the e-Government websites pages,
- Lack of adequate website content and information organizations; such as the accuracy, quality, and freshness of news, information, and content on the website
- Lack of various functionality performances and features; like: the usefulness, convenience and variety of online features and tools available on the website, and
- Hard to find information and unreadable character of font size and formatting.

To conclude, usability is essential to satisfy user to return to the e-Government website over again. If user not able to use the website, they will move away. The most effective solution is to confirm usability issues which could create a website accessible and usable for the users. Nevertheless, most of the end users' participants in this research have "not satisfied" with the current services status of Ethiopian e-Government websites and raised many issues starting from users' requirement gathering to the final developed websites services.

Moreover, with the second stage of the study analysis result of management perspectives indicates that; the government organizations ICT management members and organization concerned bureau did not give enough attentions for those main e-Government website usability implementations issues and lack of usability awareness, guidelines and standards. In addition, managements notify end-users requirements problems, poor involvements of representative users, the content of the websites were not resourceful and lack of testing and monitoring of the websites were the main identified gaps of Ethiopia e-Government websites from management point of view.

Next, with the expert-based Jakob Nielsen's Usability Heuristics rule evaluation of e-Government website usability assessment result shows that: Error Prevention, Help and Documentation of important support information and FAQ, Consistency and Standards, Flexibility and Efficiency of Use, and Users Recognize, Diagnose, and Recover from Errors were expert based assessment main identified usability problems of e-Government websites. Therefore, the current status of Ethiopia e-Government websites violates most of usability heuristics rule.

Furthermore, based on international standards for the design of Web Content Accessibility Guidelines, using online WAVE accessibility tools assessment results shows that: the Ethiopia e-Government websites have many accessibility errors and did not conform to W3C Web Content Accessibility Guidelines (WCAG) 2.0 and e-Government websites functionality features were not capable for serving disabled persons. The most highlighted accessibility problems were: lack of equivalent alternatives texts, color and style sheets design problems, structural and features problems, unclear documents and content organizations; and redundancy and empty navigation, link and header of the e-Government website services. Thus, these study results confirm that Ethiopian e-Government websites violate W3C Guidelines WCAG 2.0 standards.

At last, the aim of the study was achieved by conducting mixed and different sides' exhaustive survey, with suggested solution for improvement of Ethiopia e-Government website. Furthermore, establishing usability and accessibility roadmap model based on the study outcomes and Ethiopian context.

6.2 Recommendations

Based on the study results, there is clearly room for improving the usability and accessibility of many of the Ethiopia e-Government website/portal. Therefore, in order to address these e-Government website usable and accessible services problems and to have a quality websites service, the following recommendations were made:

Pay attention to end users' requirements, feedback and involvements throughout the development and implementation of the e-Government websites services. Also, after launching e-Government websites survey the requirements of users, for further improvement of website services and to make usable, accessible and convenient to their users.

There is a need to improve, maintain and increase, the e-Government website functionality, performances, and interface design and all its features need much improvement. Starting from the "Homepage" design should create a positive first impression of the site and it should show all the major options available on the website, and also contain a limited amount of text. The homepage need to have an option to the users that can quickly return to the home page of the websites from any point in the site. Additionally, the search function of the site should be easy to use and allow for users to be successful when searching and needs to include standardized integrated mistake correcting systems. In the design of navigation menu, it should be simple, straightforward and clear back link on each page which leads to the homepage.

Currently Ethiopian e-Government websites have fewer contents and documentations. Therefore, it should be improved and need to maintain accurate and up-to-date e-Government websites content. The website needs to have regular updating activities those used to update and review of the information on the website undertaken by the organizations, such as: news, activities, updated events, announcements information and broadcast, tender, recruitment announcements, newspaper clippings, statements or articles and poster / banner. Moreover, graphical representation and multimedia can also add great value to a website's content and creates users' attention to the most important information. Therefore, the design and content organizations of the site need to include graphic design and multimedia elements.

The Ethiopian e-Government websites pages should provide consistent user interfaces design and page organizations. These present the same options in the same way over the whole site. Consistent visual interface and layout design includes: consistent header, footer and side panels, size and spacing of characters, the colors used for labels, fonts and backgrounds, and the locations of labels, text and pictures elements within and between web pages. Therefore, more consistent e-Government websites interfaces design resulted in a reduction in task completion times, a reduction in errors, an increase in user satisfaction and a reduction in learning time (Michael & Ben, 2005).

In the case of language, e-Government websites need to have more language options. Those should be added on the e-Government website and display the content of the website in different languages, which can easily understandable and appropriate for the citizen and do not use terms that typical users may not understand.

There are a lot of icons and links on Ethiopian e-Government websites, but most of them were Federal Government Logo¹⁷, symbols, bulletin, and vague references link text. For this reason, they may not be easy to understand to users of e-Governance websites, makes unattractive design of the website, and inconsistent colors. Therefore, the interface design of Ethiopia e-Government websites icons should be more effective in representation of messages, sized and locations. As well the link labels and concepts that are meaningful, understandable, much the links text and destination pages, and the link easily differentiated by users rather than designers. Moreover, the design of the webpage needs to ensure that ‘important content’ can be accessed from more than one link.

E-Government websites found to have conformance W3C. Nevertheless, all of Ethiopian government websites failed to pass checkpoints for accessibility errors. These results recommend that W3C Guidelines WCAG 2.1 should be considered thorough out the development and implementation of e-Government websites and portals. These implementations of the W3C Guidelines WCAG used to make Ethiopian e-Government website services are accessible to the largest possible range of people. Web accessibility primarily benefits people with disabilities. However, as an accessible website is designed to meet different user needs, preferences, skills and situations, this flexibility can also benefit users without disabilities in certain situations, “such as people using a slow Internet connection, people with temporary disabilities such as a broken arm,

¹⁷ FDRE Government Logo: -



and people with changing abilities due to aging” (Yakup & Kemal, 2016) . Thus, based on the study result, there should be a way disabled person can access information using Ethiopia e-Government websites, as an example: for blinds systems based on speech as input should be considered, for deaf and dump gesture-based input should be used. Moreover, special pages should be designed for users with disabilities according to the accessibility standards.

It is always desirable to provide information available at the Frequently Asked Questions (FAQ), that page can help the user to find the solution of the problems related to usage of the e-Government website. Therefore, the e-Government websites FAQs and “contact us” menus should be functional with adequate and updated information and contents. In addition, provide online help and support services, use different multimedia and image contents to demonstrate different services and operations of e-Government websites services.

Arrange planned capacity building training on e-Government service usability and accessibility to the ICT Department and Public Relation and Communication Affairs Bureau heads and employees. In addition to this, it is very important to maximize usability awareness levels of the organizations higher officials, management members and concerned stakeholders, also resolve management problems and misunderstanding.

Additional main things for the enhancement of e-Government websites services are: build up awareness behavior to end-users and as a whole to the citizen about the website services and its operations, using various means of mass communication and private computer kiosk facility. Simple training session can be helpful for those users and computer kiosk centers, who have no previous experience of using it or who are hesitant to use e-Government websites.

Last but not the least recommendation is the government organizations need to implement regular usability and accessibility assessment and investigation on their website, with different evaluation standards, and using the proposed model as a roadmap. This used to make the usability and accessibility of the e-Government websites on early phases of development process and throughout service function. Furthermore, based on the identified problem, recommendations are issued to the concerned bodies to improve their websites service delivery.

6.3 Research Limitations

As can be seen from the literature review section, the first limitation of this research study was insufficient literature in Ethiopian context for review about the studied field. More particularly, very few literatures were found about Ethiopian e-Government websites/ portal usability, accessibility and security assessment.

Another limitation of the study lacks comments from software developer companies as additional evaluation checklist. However, some government organization can design their website by their internal staff; thus, we try to address those expertise's point of view, but most of the organizations design their portal/website by hiring external company or with other institutes.

6.4 Future research

This research project identifies the current e-Government website usability and accessibility problems and proposes e-Government usability and accessibility model. However, assess the web security vulnerabilities of e-Government websites, and further validate the proposed model can be the future researchers study work, instead of creating new model. These will help to enhance the quality, efficacy and information security of websites services and the proposed website model.

In addition to this, the scope of the study was only on e-Government websites and portals; these belong to public or government administration and services. Moreover, for the future, commercials and educational sectors website services needs to assess their usability, accessibility and security issues. Additionally, develop evaluation model and guidelines for other sector websites/portals study areas will be the future among the professionals.

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Appendix: A – Organizations’ and Number of Electronics Services

Ethiopia Government Organizations and Electronics Services			
SN	Organization	Type	# of e-Services
1	Public Servants Social Security Agency	Agency	6
2	Ministry of Trade	Ministry	7
3	Ministry of Foreign Affairs	Ministry	6
4	Ministry of Agriculture and Natural Resources*	Ministry	10
5	Ministry of Communication and Information Technology	Ministry	10
6	Federal Transport Authority	Authority	18
7	Ministry of Water, Irrigation and Electricity	Ministry	11
8	Ministry of Women and Children Affairs	Ministry	4
9	Ministry of Public Service and Human Resource Development*	Ministry	7
10	Ethiopian Broadcasting Authority*	Authority	6
11	Ministry of Minerals, Petroleum and Natural Gas*	Ministry	6
12	Accounting and Auditing Board of Ethiopia	Others	4
13	Ethiopian Investment Commission	Commission	3
14	Ethiopian Management Institute	Institute	2
15	Federal Supreme Court	Court	2
16	Government Communication Affairs Office	Others	4
17	Ministry of Federal and Pastoralist Affairs	Ministry	4
18	Ministry of Construction	Ministry	4
19	Metal and Engineering Corporation	Corporation	2
20	Private Organization Employees Social Security Agency	Agency	2
21	Federal Housing Corporation	Corporation	5
22	Ethiopian Postal Service Enterprise	Enterprise	2
23	Ministry of Livestock and Fisheries	Ministry	2
24	Trade Practice and Consumers Protection Authority	Authority	1
25	Food, Medicine and Health Care Administration and Control Authority*	Authority	6
26	National Education Assessment and Examination Agency	Agency	2
27	Federal Urban Job Creation and Food Security Agency	Agency	5
28	AA City Administration Vital Events Registration Agency*	Agency	6
29	AA City Government Vehicle and Driver License Control Authority	Authority	4
30	AA Water and Sewerage Authority	Authority	3
31	AA City Administration Education Bureau	Bureau	2
32	AA City Administration Justice Bureau	Bureau	2
33	AA City Administration Micro and Small Enterprises Development Bureau	Bureau	1
34	AA City Courts	Court	5

* Not fully functional

Source: Electronics Government Directorate–MCIT (2017)

Appendix: B – Letter of Support Request

አዲስ አበባ ዩኒቨርሲቲ
የተፈጥሮ ሳይንስ ኮሌጅ
የኢንፎርሜሽን ሳይንስ ት/ቤት



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To Whom It May Concern

Student **Yoseph Zeleke** (ID.No. GSE/0388/08) is a graduate student at the School of Information Science, Addis Ababa University. He is currently conducting a MSc. thesis research under the title “Usability Evaluation Model for E-government Websites in Ethiopia”.

I would like to thank you in advance for all the assistance that you would provide to the student.

With Regards,



Martha Yifru (PhD)

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Appendix: C -Questionnaire for Management Perspectives Evaluation

Dear Respondent,

I am Yoseph Zeleke, a postgraduate student. Currently, I am attending Master of Science in Information Science at Addis Ababa University, Ethiopia.

This questionnaire aims to investigate the level of usability of current e-government websites and portal in Ethiopia from ICT section management and experts' head. It is a part of a comprehensive study to find out how to improve the Ethiopia e-government websites and portal for better utilisation and a more successful e-government scheme in Ethiopia.

Therefore, your assistance is highly appreciated by providing your valuable information using the following questionnaire and the information you provide will be **confidential and will only be used for this research**.

If you require any assistance or clarification, please do not hesitate to contact me through, my cell phone +251-911-715953.

NB: You need not write your name

Thank you for your willingness to participate in this study!

A. Demographics and situation

❖ You can put a right mark “✓” sign for your response from the choices

1. Gender: ☐ Male ☐ Female
2. Age: ☐ 22-30 ☐ 31-40 ☐ 41-50 ☐ 51-65 ☐ Over 65
3. Your current job position:
☐ Manager / Director ☐ Office head
☐ Team leader ☐ Senior IT expert/ Coordinator
✓ Please specify, if any others _____
4. Which of the following is the highest educational degree you have achieved?
☐ Bachelor degree ☐ Postgraduate ☐ PhD
✓ Please specify, if any others _____
5. How long are you working with e-government related project development?
☐ Less than one year ☐ 1-2 years ☐ 2-4 years ☐ More than 4 years

B) Management perspective evaluation of e-government website's usability and practice

Description: Website usability generally means that websites are clear, simple, consistent and easy for users to use. The primary focus of evaluating the usability is on the elements of learnability, memorability, effectiveness, efficiency and satisfaction for all portal/website developers and users

❖ You can put a right mark “✓” sign for your response from the given choices

1. Is usability evaluation important for website design?

☐ Yes ☐ Possibly Yes ☐ Not Sure ☐ Possibly No ☐ No

2. Do you use usability evaluation methods (UEMs) during development and upgrading of every e-government website and portal?

☐ Yes ☐ Possibly Yes ☐ Not Sure ☐ Possibly No ☐ No

• If your answer is “Yes”: ➞

2.1. Who evaluates the usability of website applications in your organization?

☐ Developers ☐ Testers ☐ Organization's IT experts' ☐ Project Manager

✓ Please specify if any others _____

2.2. Which of the following usability evaluation or testing methods you have used practically in your projects?

☐ User-based usability evaluation methods

☐ Evaluator-based usability evaluation methods

☐ Automatic website evaluation tools methods

☐ Both evaluation methods

3. What are the major constraints in making usability evaluation methods as an integral part of website development projects?

☐ Less time ☐ Less budget ☐ Lack of usability expert

☐ Lack of usability understanding ☐ Too much conservative management

✓ Please specify if any others _____

4. Based on your e-government website management and practice, what is your rating level of e-government website interfaces and/or layout?

☐ Very good ☐ Good ☐ Average ☐ Below Average ☐ Poor

5. Based on your e-government website management and practice, what is your rating level of e-government website usability?

☐ Very good ☐ Good ☐ Average ☐ Below Average ☐ Poor

6. Is the government (your organization) offering any incentives to increase and encourage the usage of its websites?

☐ Yes

☐ No

✓ If your answer is “Yes”: What types of incentives were facilitated for the organization employees and customers? _____

7. Have you ever received any complaint about the difficulties faced by the users of e-government website regarding web interfaces, usability and e-government in general?

☐ Yes, Regularly

☐ Yes, Rarely

☐ No

✓ If your answer is “Yes”, please let me know about the sources of complaints:

○ _____

8. Concerning the success or failure of e-government projects in general, consideration of usability is:

☐ Very important

☐ Important

☐ I don't know much about it

☐ Unimportant

☐ Very Unimportant

C) Instruction: - Please indicate your Level of Agreement for the following questions, by

Putting a “✓” mark sign in the circle of the questions

No	Level of reaction to the e-government website	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
		Value=1	Value=2	Value=3	Value=4	Value=5
1.	The e-government website or portal structure mechanism such as e-mail, FAQs... is sufficient to address the problems faced by the users.	○	○	○	○	○
2.	The language of the Ethiopia e-government website is understandable and appropriate	○	○	○	○	○
3.	I use the e-government website regularly for most of my information needs and transaction activities.	○	○	○	○	○
4.	The content of the website met my expectations	○	○	○	○	○
5.	Icons and links on the e-government website provide meaningful information.	○	○	○	○	○

D) Instruction: - Open-ended questions

1. Please list what you liked most about the Ethiopia e-government website.

✱ _____
✱ _____

2. Please list what you like to see changed or/and added on the Ethiopia e-government website.

✱ _____
✱ _____
✱ _____

E) Instruction: - Please indicate your Level of Agreement for the following questions, by Putting a “✓” mark sign in the circle of the questions

1. The following lists considered one of “ <i>the biggest challenges</i> ” of making e-government website usable for users (customers)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Value=1	Value=2	Value=3	Value=4	Value=5
1. Lack of budget	☐	☐	☐	☐	☐
2. Lack of awareness of usability (absence of guidelines and standards)	☐	☐	☐	☐	☐
3. Lack of feedback from end-users (customers)	☐	☐	☐	☐	☐
4. Lack of end user involvement in the initial stage of design	☐	☐	☐	☐	☐
5. Management problems	☐	☐	☐	☐	☐
2. What is your level of agreement on the following resources “ <i>for improving and increasing the usability</i> ” of existing e-government website	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Value=1	Value=2	Value=3	Value=4	Value=5
1. Trained staff	☐	☐	☐	☐	☐
2. More budget	☐	☐	☐	☐	☐
3. Involving end-users	☐	☐	☐	☐	☐
4. Clear guidelines and standards	☐	☐	☐	☐	☐
5. Applying planed usability evaluation or assessment	☐	☐	☐	☐	☐

✓ **The following are some of the most difficult things faced by the users of e-government website regarding the “interface and usability” in accordance to the complaints received**

3. Please indicate your level of agreement for the following questions	YES	POSSIBLY YES	I AM NOT SURE	POSSIBLY NO	NO
	Value=1	Value=2	Value=3	Value=4	Value=5
1. Did you pay attention to the end user requirements before establishing the e-government website?	☐	☐	☐	☐	☐
2. Did you survey the requirements of end user after launching e-government website for further improvement?	☐	☐	☐	☐	☐
3. Have you or any of your staff ever attended any training on the usability of e-government websites before or after the project?	☐	☐	☐	☐	☐

Thank you very much for your assistance and co-operation!

Appendix: D- Questionnaire for Users' Perspectives Evaluation

Dear Respondent,

I am Yoseph Zeleke, a postgraduate student. Currently, I am attending Master of Science in Information Science at Addis Ababa University, Ethiopia.

This questionnaire aims to investigate the level of usability of current e-government websites and portal in Ethiopia from end-users and customers perspectives. It is a part of a comprehensive study to find out how to improve the Ethiopian e-government websites and portal for better utilisation and a more successful e-government scheme in Ethiopia.

Therefore, your assistance is highly appreciated by providing your valuable information using the following questionnaire and the information you provide will be **confidential and will only be used for this research purpose**.

If you require any assistance or clarification, please don't hesitate to contact me through, Cell Phone +251-911-715953.

NB: You need not write your name

Thank you for your willingness to participate in this study!

A) Pre-Test Questionnaire

❖ You can put tick “✓” mark sign for your response from the given choices

1. Gender: ☐ Male ☐ Female

2. Age: ☐ 22-30 ☐ 31-40 ☐ 41-50 ☐ 51-65 ☐ Over 65

3. How do you rate your own basic computer use?

☐ Below basic level ☐ Basic ☐ Competent

4. How do you describe your level of expertise with the internet?

☐ Excellent ☐ Good ☐ Fair ☐ Poor

5. Do you use the Ethiopian e-government websites (i.e. communicating with the government organizations through the internet?)

☐ Always ☐ Sometimes ☐ Rarely ☐ Never

B) Overall usability assessment questionnaires for Ethiopian e-government website

Description: Website usability generally means that websites are clear, simple, consistent and easy for users to use. The primary focus of evaluating the usability is on the elements of learnability, memorability, effectiveness, efficiency and satisfaction for all portal/website developers and users

❖ You can put a tick “✓” mark sign for your response from the given choices

1. Organization of e-government website information is?

☐ Confusing ☐ Clear ☐ Very Clear

2. Sequence of e-government website’s page is?

☐ Confusing ☐ Clear ☐ Very Clear

3. Reading characters on the website’s page is?

☐ Hard ☐ Moderate ☐ Simple

4. Ethiopia e-government websites’ the functionality and capability performance are?

☐ Poor ☐ Good ☐ Excellent

5. Reliability (trustworthy) level of the Ethiopian e-government website is?

☐ Poor ☐ Good ☐ Excellent

C) The following questions considered one of the main challenges of making website usable for users. So, for evaluating Ethiopian e-government website usability level from user perspective, please put a tick “✓” sign mark for your response from the choices

No.	List of the main challenges of making website usable for users	Yes	Possibly Yes	Not Sure	Possibly No	No
1.	Websites are designed for all levels of users (Designed with different user levels in mind)	☐	☐	☐	☐	☐
2.	Memorable URL for home page (Uniform Resource Locator /URL/: the address of a web page)	☐	☐	☐	☐	☐
3.	Websites have integrated mistake correcting systems	☐	☐	☐	☐	☐
4.	The e-government portal provides me the necessary help that is required	☐	☐	☐	☐	☐
5.	Font is readable size	☐	☐	☐	☐	☐
6.	The websites have up to date information	☐	☐	☐	☐	☐
7.	Visuals serve purpose and are not strictly decorative	☐	☐	☐	☐	☐
8.	No “under construction” pages	☐	☐	☐	☐	☐
9.	No dead links	☐	☐	☐	☐	☐
10.	I will likely use this website in the future	☐	☐	☐	☐	☐

D) Please read each statement and indicate how strongly you agree or disagree with each statement by putting a tick “✓”mark sign for your response from the choices in the circle.

No	Overall level of user reaction to the E-Government website	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
		Value=1	Value=2	Value=3	Value=4	Value=5
1.	This website is visually appealing (attractive)	☐	☐	☐	☐	☐
2.	The overall organization of the site is easy to very understandable and easy to use	☐	☐	☐	☐	☐
3.	I thought there was too much inconsistency in this website	☐	☐	☐	☐	☐
4.	The content of the website met my expectations	☐	☐	☐	☐	☐
5.	The language of the website was understandable and appropriate	☐	☐	☐	☐	☐
6.	It is easy to find the information/ service which is related to the task	☐	☐	☐	☐	☐
7.	Navigation menu is simple and straightforward	☐	☐	☐	☐	☐
8.	The links are easy to find (e.g. underlined text to indicate links)	☐	☐	☐	☐	☐
9.	There is a clear back link on each page which leads to the homepage	☐	☐	☐	☐	☐
10.	The e-government websites save my time for completing the task.	☐	☐	☐	☐	☐
11.	I think I would need technical support to be able to use this website	☐	☐	☐	☐	☐
12.	The e-government websites highlight the most important content at the main page.	☐	☐	☐	☐	☐
13.	I felt very confident using the website	☐	☐	☐	☐	☐
14.	Icons and links on the e-government website provide meaningful information to me.	☐	☐	☐	☐	☐
15.	I would use the website regularly for most of my information needs.	☐	☐	☐	☐	☐

Thank you very much for your assistance and co-operation!

Appendix: E - Screenshot of on-line questionnaire for management perspective

Link address: [<https://docs.google.com/forms/d/e/1FAIpQLSfvuxzOp5CzxEUaYHk9-jseJmgge474w2vCb2wYbh02zX0Qw/viewform>]

The screenshot shows a Google Forms interface in a web browser. The title of the form is "Survey Questionnaire to Assess Ethiopia E-Government Websites". The form is currently in the "QUESTIONS" tab, and there are 17 responses recorded. The form content includes a greeting, a description of the study, and two sections of questions. Section A, "Demographics and situation", includes questions about gender and age. Section B, "IT Management and Senior Expert perspective evaluation of e-government website's and portal's usability and practice", includes questions about the importance of usability evaluation and the use of usability evaluation methods (UEMs).

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Addis Ababa University School of Information Science

Survey Questionnaire to Design Usability Evaluation Model for E-Government Websites and Portals in Ethiopia

Dear Respondent,

I am Yoseph Zeleke, a postgraduate student. Currently, I am attending Master of Science in Information Science at Addis Ababa University College of Natural Science.

This questionnaire aims to investigate the level of usability and accessibility of current e-government websites, portals and related services in Ethiopia from ICT section management, Head expert's and IT senior Professionals. It is a part of a comprehensive study to find out how to design and improve Usability Evaluation Model for E-Government Websites, Portals and related services for better utilisation and a more successful e-government scheme in Ethiopia.

Therefore, your assistance is highly appreciated by providing your valuable information using the following

A. Demographics and situation

Description (optional)

1. Gender

☐ Female

☐ Male

2. Age

☐ 22-30

☐ 31-40

☐ 41-50

☐ 51-65

☐ Over 65

B) IT Management and Senior Expert perspective evaluation of e-government website's and portal's usability and practice

Description-- "Website/portal usability" generally means that websites/portals are clear, simple, consistent and easy for users to use. The primary focus of evaluating the usability is on the elements of learnability, memorability, effectiveness, efficiency and satisfaction for all portal/website developers and users

1. Is usability evaluation important for website/portal design? *

☐ Yes

☐ Possibly Yes

☐ Not Sure

☐ Possibly No

☐ No

2. Do you use usability evaluation methods (UEMs) during development and upgrading of every e-government website/portal and/or other electronics services? *

☐ Yes

☐ Possibly Yes

☐ Not Sure

☐ Possibly No

☐ No

Appendix: F - Screenshot of on-line questionnaire for user perspective

- **Link Address: -**

[https://docs.google.com/forms/u/0/d/1ECpquxEHwIrAKhEAAmHQvWh5tfT7_eC8N_S5sG44gGM/edit?usp=forms_home&ths=true]

The screenshot shows a Google Forms interface for a survey titled "Survey Questionnaire to Assess E-Government Websites and Portals Usability Evaluation". The form is viewed from the "User Perspectives" tab. The header bar is blue with a "SEND" button and a user profile icon. The main content area is white with a blue border. The form includes a greeting, a description of the study, and a list of questions. The questions are: 1. Gender (Female, Male), 2. Age (22-30, 31-40, 41-50, 51-65, Over 65), 3. How do you rate your own basic computer use? (Below basic level, Basic, Competent, Add option or ADD 'OTHER'), and 4. How do you describe your level of expertise with the internet? (Excellent, Good, Fair, Poor). The form is set to "Required" and has a "Checkboxes" option selected. The bottom of the screen shows a Windows taskbar with various icons and a system clock indicating 7:14 PM on 7/1/2018.

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Survey Questionnaire to Assess E-Government Websites and Portals Usability Evaluation

Dear Respondent,

I am Yoseph Zeleke, a postgraduate student. Currently, I am attending Master of Science in Information Science at Addis Ababa University, Ethiopia.

This questionnaire aims to investigate the level of usability of current e-government websites and portal in Ethiopia from end-users and customers perspectives. It is a part of a comprehensive study to find out how to improve the Ethiopian e-government websites and portal for better utilisation and a more successful e-government scheme in Ethiopia.

Therefore, your assistance is highly appreciated by providing your valuable information using the following questionnaire and the information you provide will be confidential and will only be used for this research purpose.

If you require any assistance or clarification, please don't hesitate to contact me through, Cell Phone +251-911-715953.

Thank you for your willingness to participate in this study!

A) Pre-Test Questionnaire

Please put a tick sign mark (only one item) for your response from the choices

1. Gender:

☐ Female

☐ Male

2. Age:

☐ 22-30

☐ 31-40

☐ 41-50

☐ 51-65

☐ Over 65

3. How do you rate your own basic computer use?

☐ Below basic level

☐ Basic

☐ Competent

☐ Add option or ADD 'OTHER'

4. How do you describe your level of expertise with the internet?

☐ Excellent

☐ Good

☐ Fair

☐ Poor

Required

Appendix: G - Interview Outline

- This Interview is used to identify IT management and e-Government websites management perspective of Ethiopian e-Government websites usability and accessibility issues.

Q: Do you think usability evaluation important for website design?

Q: Do you use usability evaluation methods (UEMs) during development and upgrading of every e-Government website and portal?

Q: What do you think concerning the success or failure of e-Government projects in general, consideration of usability and accessibility?

Q: Is the government (your organization) offering any incentives to increase and encourage the usage of its websites?

Q: Do you use the requirements survey of end user after launching the website for further improvement?

Q: What are the min drawbacks of the Ethiopian e-Government websites in your opinion?

Q: Have you ever received any complaint about the difficulties faced by the users of e-Government website regarding web interfaces, usability and e-Government in general?

Q: Is there any capacity building work, like training, awareness creation, etc ..., related to e-Government websites usability and accessibility by your organizations or other stakeholders?

Q: How e-Government websites and portals could be better for providing government services?